Technical Study 20

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ABSTRACT

A METHODOLOGY FOR EVALUATING FINANCIAL INCENTIVES TO CREATE EMPLOYMENT

Donald R. Lessard, Carliss Y. Baldwin and Scott P. Mason

This report addresses the topic of how financial incentives may be used to further employment goals. Our primary purpose is to examine sources of actual or potential asymmetry between the public budgeting cost of a financial incentive and the private behavior that ensues.

Private behavior may differ from public expectations when the incentive grants options not forseen by the public sector analyst. For example, to create jobs in a particular region, the federal government might guarantee the debt of a risky venture. However, private entrepreneurs always have the option of abandoning their enterprise should the venture fare poorly. Society would then have induced real investment in a venture that obtained little or no public benefit. When using financial incentives to influence private sector decisions, it is important to understand the likely impact of the incentive on private decision-making and its consequent effectiveness in promoting particular employment goals.

Financial evaluation of an enterprise is essential to the design of appropriate incentives and is concerned with identifying sources of risk within the enterprise and assessing the degree to which they contribute to the total risk borne by society. Although further empirical research is needed, it appears that with few exceptions the "employment" risk of firms and industries, as perceived by society, and the aggregate investment risk, will in most

cases be highly correlated. Therefore, certain risk measures applied in financial evaluations can also have important implications from an employment perspective. These factors are (1) the operating risk of the business and (2) the financial risk inherent in the capital structure (including the scheduling of maturities of liabilities and the implicit incentives to managers and shareholders to abandon a failing enterprise). The employment implications of these factors are discussed in detail in our report.

We also examine each major type of incentive -- cash grants, tax reductions, concessionary debt (or equity) and loan (or equity) guarantees. Our analysis focusses on estimation of the private market value as well as on the current budgeting cost of each form of intervention. The value of an incentive can also be compared meaningfully to the number and types of jobs created (i.e., temporary or permanent, continuing or new, socially risky or riskless) to verify that public resources are allocated efficiently.

We also consider how each type of intervention affects managerial incentives to select projects with lower-than-normal employment benefits or to manage ongoing projects suboptimally. These "incentive effects" carry implications for the choice among different forms of intervention as well as for the covenants, restrictions and performance conditions necessary to ensure that public funds are used appropriately.

From our comparative analysis we conclude that when employment objectives are the primary reason for public intervention, the preferred type of financial incentive is a taxable deferred cash grant, conditional on the performance

of specific employment objectives. Such an incentive ensures congruence between private incentives and public policy goals. It can be intermediated through the capital market to give the firm command over current resources. It does not induce a bias towards capital inputs. It does not cause the public to bear an asymmetric share of the operating and/or financial risk of the venture. Providing the grant is taxable there will be few leakages between the public purse and the ultimate recipient; and, finally, this type of incentive is applicable to almost all situations in which public assistance would be sought.

In conjunction with our survey, we study actual financial incentives in a number of specific cases. The recipients of assistance range from financially distressed corporations to going concerns, to enterprises just starting up.

The mechanism of the deferred cash grant was employed in only one case. However, it was accompanied by more immediate financial assistance from the provincial government.

The cost of guaranteeing a portion of the existing long-term debt of eight Canadian firms was estimated in our analysis. The estimates demonstrate that guarantees are not costless and are affected by a firm's financial structure and the volatility of its earnings.

Where financial assistance is provided, the following questions arise:

1. To what extent is the financial incentive explicity or implicitly tied to employment goals?

2. To what extent does the financial incentive contribute to the creation (or continuation) of permanent jobs?

As far as we are able to determine, only one firm made explicit commitments to stated employment goals and these were of a "best efforts" type; assistance was not conditional on compliance with these goals.

From our study it appears that natural resource investments do not create substantial permanent employment as they tend to be capital intensive and the jobs created are temporary and construction-related. The infrastructure supporting these projects (the most common form of public intervention) is also capital intensive and thus weighted to the creation of temporary jobs. Finally, because infrastructure is subsidized and employment is not, companies have incentives to over-invest in capital-intensive, labour-saving technology even in areas of high unemployment.

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MÉTHODOLOGIE POUR L'ÉVALUATION DES STIMULANTS FINANCIERS A LA CRÉATION D'EMPLOIS

Donald R. Lessard, Carliss Y. Baldwin et Scott P. Mason

Ce rapport examine comment les stimulants financiers peuvent permettre d'atteindre les objectifs liés à l'emploi. Nous avons pour but premier d'étudier les sources d'asymétrie réelle ou éventuelle entre le coût budgétaire pour le secteur public d'un stimulant financier et le comportement du secteur privé qui s'ensuit.

Ce comportement du secteur privé peut différer des attentes du gouvernement lorsque le stimulant offre des possibilités que les analystes du secteur public n'avaient pas prévues. Par exemple, pour créer des emplois dans une région particulière, le gouvernement fédéral pourrait garantir la dette d'une entreprise qui présente un élément de risque. Cependant, les entrepreneurs du secteur privé ont toujours le choix de fermer leurs portes si les affaires vont mal. Le cas échéant, la société aurait vraiment investi dans une entreprise qui s'est révélée peu ou pas profitable pour le public. Lorsqu'on utilise les stimulants financiers pour influer sur les décisions du secteur privé, il est important de comprendre les répercussions probables du stimulant sur le processus de prise de décisions du secteur privé et de son efficacité à promouvoir des objectifs d'emploi précis.

Pour assurer que les stimulants soient appropriés, il est essentiel d'évaluer la situation financière d'une entreprise en déterminant les sources de risque au sein de l'entreprise et la mesure dans laquelle elles contribuent au risque total pour la société. Même si une recherche empirique plus poussée s'impose, il semble, à quelques exceptions près, que le risque des entreprises et des industries sur le plan de l'emploi, tel que perçu par la société, et le risque total lié à l'investissement soient

dans la plupart des cas intimement liés. Par conséquent, certains "facteurs de risque" dont on a tenu compte dans l'évaluation financière peuvent également avoir d'importantes répercussions sur le plan de l'emploi. Ces facteurs sont (1) le risque que présente le fonctionnement de l'entreprise et (2) le risque financier inhérent à la structure de l'investissement (y compris l'établissement de l'échéancier des dettes et les raisons implicites qui motivent les gestionnaires et les actionnaires à délaisser une entreprise qui roule). Notre rapport examine en détail les répercussions de ces facteurs sur le plan de l'emploi.

Nous étudions également chacun des principaux types de stimulant, à savoir les subventions directes, les stimulants fiscaux, les prêts assortis de conditions de faveur et les garanties de prêts. Notre analyse porte plus spécialement sur une estimation de la valeur, sur le marché privé, de chaque forme d'intervention ainsi que sur le coût actuel des ressources que l'intervention met en jeu. La valeur d'un stimulant peut également être comparée de façon significative au nombre et au genre d'emplois créés (par exemple temporaires ou permanents, continus ou nouveaux, présentant ou non un élément de risque pour la société) pour voir si les ressources publiques sont judicieusement affectées.

Vient ensuite la façon dont chaque type d'intervention pousse ou non les cadres à sélectionner des projets qui présentent des avantages inférieurs à la normale sur le plan de l'emploi ou à gérer des projets permanents dans des conditions moins qu'optimales. Ces "effets d'incitation" comportent des répercussions quant aux choix à faire entre les différentes formes d'intervention, de même que pour ce qui a trait aux ententes, aux restrictions et aux conditions d'exécution nécessaires pour veiller à ce que les deniers publics soient utilisés à bon escient.

Notre analyse comparative nous amène à conclure que lorsque les objectifs d'emploi représentent la principale raison de l'intervention de l'État, le stimulant financier à privilégier serait une subvention directe imposable qui ne serait accordée que moyennant la réalisation d'objectifs précis en matière d'emploi. Un tel stimulant permet d'harmoniser les incitations du secteur privé et les objectifs de la politique publique. La subvention pourrait être accordée par l'intermédiaire du marché de capitaux pour accorder à l'entreprise le contrôle des ressources courantes. Ce genre de stimulant ne favorise pas indûment l'injection de capitaux; n'amène pas le public à assumer d'une façon disproportionnée le risque que présente l'entreprise sur le plan du fonctionnement et (ou) sur le plan financier; le risque de perte entre le moment où la subvention est prélevée sur les deniers publics et celui où le bénéficiaire la reçoit sera moins grand si la subvention est imposable; et, enfin, ce genre de stimulant peut s'appliquer à presque toutes les situations où l'on pourrait faire appel à l'aide de l'État.

Dans le cadre de notre enquête, nous étudions l'octroi de stimulants financiers dans un certain nombre de cas précis. Les bénéficiaires vont des entreprises en difficulté financière à celles qui sont en pleine activité ou celles qui viennent d'ouvrir leurs portes.

La subvention directe différée n'a été utilisée que dans un seul cas (Les Produits forestiers Tembec). Cependant, cette subvention a été accompagnée d'une aide financière plus immédiate de la part du gouvernement provincial.

Dans le cas des entreprises en pleine activité, nous avons estimé le coût de la garantie d'une partie de la dette à long terme au sein de huit entreprises canadiennes. En ce qui a trait aux entreprises qui ont en fait bénéficié d'une

aide financière, nous soulevons les questions suivantes:

1. Dans quelle mesure le stimulant financier est-il explicitement ou implicitement lié à des objectifs d'emploi?

2. Dans quelle mesure le stimulant financier a-t-il contribué à la création (ou au maintien) d'emplois permanents?

Autant que nous puissions le constater, une seule entreprise s'est engagée explicitement à "essayer le plus possible" d'atteindre des objectifs d'emploi précis. A remarquer que l'aide financière n'a pas été accordée sous réserve que ces objectifs soient atteints.

D'après notre étude, il semble que les investissements dans les projets de mise en valeur des ressources naturelles ne permettent pas de créer un grand nombre d'emplois permanents, car ils tendent à être axés sur les capitaux, les emplois créés étant temporaires et liés à la construction. L'infrastructure nécessaire à ces projets (soit la forme la plus commune d'intervention de l'État) est également axée sur les capitaux et suppose donc une distortion qui privilégie la création d'emplois temporaires. Enfin, comme l'infrastructure est subventionnée et que l'emploi ne l'est pas, les entreprises sont portées à investir exagérément dans une technologie axée sur les capitaux et font appel à moins de travailleurs, même dans les régions où le chômage est élevé.

I. INTRODUCTION AND OVERVIEW

Government grants and subsidies to encourage the creation of new jobs can be justified on a variety of grounds. Most have to do with the externalities of job creation or human capital formation. On the job creation side, it is commonly argued that the social opportunity cost of certain types of labor is less than the private wage and, hence, private grants or subsidies to increase the employment of labor are socially justified. In terms of human skills creation, it is argued that employers cannot readily capture or appropriate all of that the benefits of training programs or on-the-job training, since these accrue to the employee in a free society, and, thus, the social value of such expenditures for human capital will exceed the private cost and again some public intervention is justified.

Financial incentives in the form of concessional loans, loan guarantees, or tax advantages are used extensively to support job creation. In addition to the fundamental justifications for such interventions linked to externalities in labor markets, financial incentives are often justified on the basis of presumed "gaps" in capital markets which cause the private cost of capital to exceed the public cost, thus resulting in forgone investment and an associated loss of employment opportunities.

Objective of the Study

The objective of this report is to outline a methodology for calculating the cash grant equivalent and evaluating the likely

effectiveness of various financial grants and incentives for job creation. The methodology provides a means for public officials to assess and increase the efficiency of incentives used to induce the desired private sector response. An analysis of the efficiency of various market interventions requires answers to three questions:

1. Do the social benefits of the project exceed the cost of real resources committed to the project?

2. Is the incentive sufficient to induce the firm to undertake the project?

3. Is the financial incentive structured to minimize its cash grant equivalent cost?

4. Does the structure of the financial incentive create managerial options which reduce the social benefit of the project?

Since the social benefits of job-creating programs are examined elsewhere in the study, we will in general not attempt to estimate the externalities of job or human skills creation. Our analysis of the cash grant equivalents of financial incentives and their likely impacts on private sector decision-making, therefore, is only one input to public decisions regarding market interventions for employment creation.

Careful examination of financial incentives along lines of efficiency and effectiveness is important for three reasons. First, financial incentives are among the most widely used government interventions for employment creation and hence deserve careful analysis. Second, financial incentives are often preferred over other incentives because their future budgetary implications are not fully understood. Hence, it is quite possible that financial incentives are employed in

situations where, for given public benefits, the cash grant equivalent cost has not been minimized. Third, there is reason to believe that many financial incentives create managerial options for firms in the selection and/or management of projects, such options may result in managerial actions which are substantially different than those anticipated by public sector analysts, and which reduce the social benefit of the project.

Evaluation of Financial Incentives Within the Overall Context of Social Cost/Benefit Analysis

Our evaluation of financial incentives is set within the context of social cost/benefit analysis as employed by the Canadian government. Such analysis attempts to incorporate the various externalities associated with a given activity with its private benefits and costs in order to determine its desirability to society as a whole. In the area of employment, in cases where a project's net social benefits are positive but net private benefits are negative, social cost/benefit analysis provides the justification for direct public investment or intervention in private markets.

While social cost/benefit analysis is concerned with questions of equity as well as efficiency, its primary focus as applied within Canada is efficiency. The impact of public interventions on the distribution of income across regions, classes of employees, or individuals is seen as important, but by and large is treated as a set of qualitative benefits that must be traded off against overall economic efficiency.

If an economy is made up of perfectly competitive markets for all goods where prices reflect all social costs and benefits, there is no need for public intervention to increase efficiency since the composition and distribution of the economy's output is Pareto optimal (it cannot be altered so as to improve anyone's welfare without reducing the welfare of others) and the amount and composition of investment is optimal. This may be termed an efficient economy. For many reasons, real economies are not efficient in this abstract sense. Reasons for private market failure include (a) externalities which are not fully recognized in some transactions and (b) the absence of means to assure the optimum investment in the production of public goods. In these cases, it is argued that public intervention enhances economic efficiency.

Public intervention may be in the form of regulation or financial incentives. The public sector will typically regulate a private market when it is felt that certain externalities are not being properly recognized. Examples would be regulations governing product safety or pollution. Financial incentives are an indirect means of public intervention in private markets often used to induce private action which will lead to positive eternalities. An example of such an externality is the training of workers who later go to work for other firms which avoid the training costs. In theory, the incentive is designed to leave a particular market participant at least as well off, and the rest of society strictly better off, as a result of the intervention.

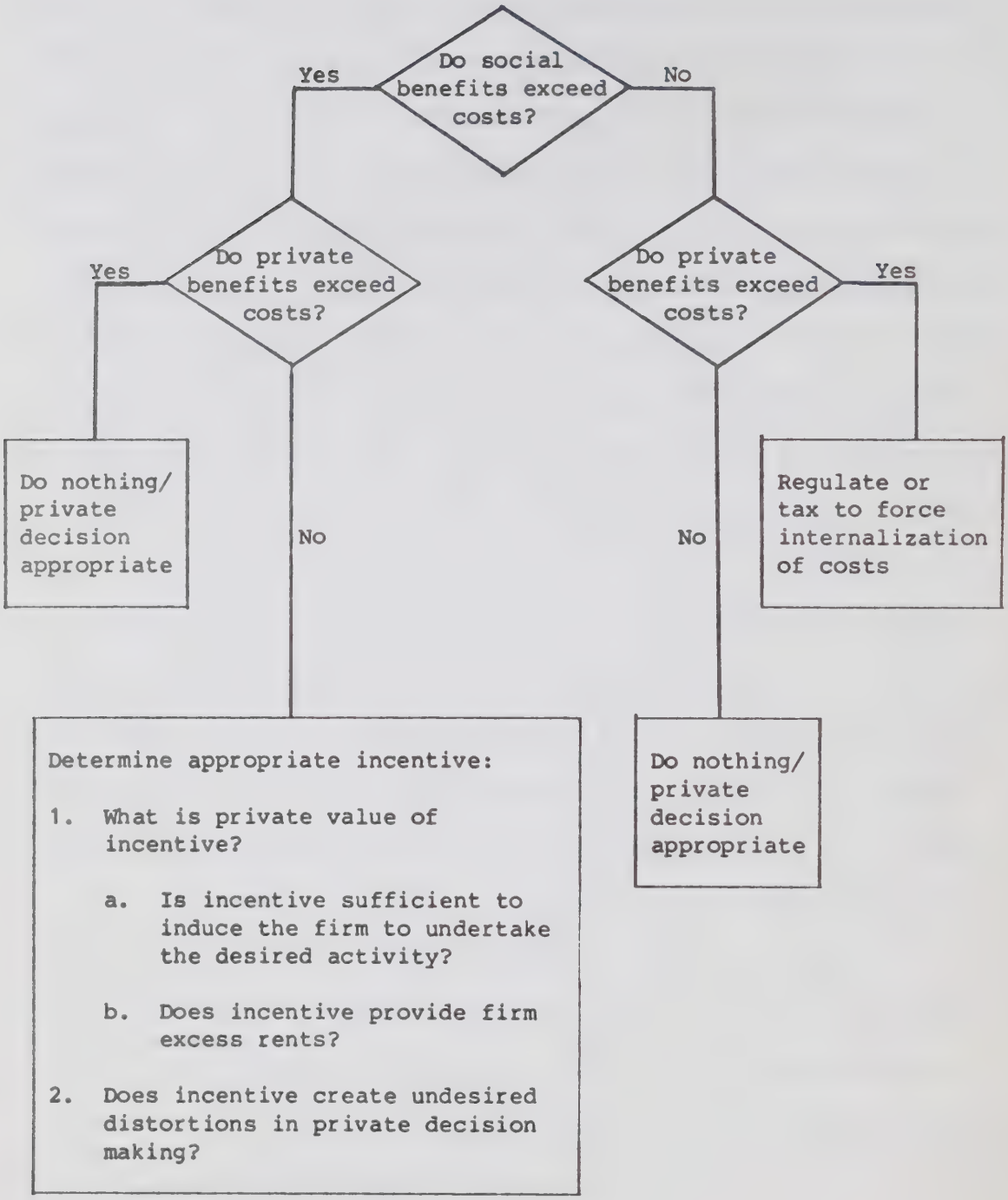
Since at one level, the incentive granted is merely a transfer from one group of citizens (taxpayers) to another (the owners and employees of the beneficiary firm), it might be argued that from the viewpoint of social efficiency the magnitude of the transfer involved in a given incentive is irrelevant. All that matters is whether the allocation of real resources to the activity induced by the incentive is socially desirable. Clearly, the society should be most concerned with these overall net benefits. However, there are several reasons why society may wish to minimize the magnitude of transfers.

First, to the extent that some of the transfers accrue to foreign investors, there is a leakage which reduces the overall social net benefit of the undertaking. Second, to the extent that society is unable to appropriate through the fiscal system an amount equivalent to the transfer, it may be forced to increase taxes elsewhere in the economy, thus displacing certain socially beneficial activities which cease to be privately feasible. Finally, it may be merely a matter of preference. Citizens and government officials may dislike government transfers that enrich certain persons unduly. While this admittedly involves bringing distributional considerations back into the analysis, it does appear to be realistic.

Figure I-1 depicts a framework for evaluating financial transfers where there is concern with the magnitude of the transfers involved as well as with the net benefits to society. In the course of the analysis, the government analyst/negotiator must (a) evaluate the entire project from a social perspective, (b) evaluate the entire project from a private perspective, and (c) determine the private

Figure I-1

Framework for Evaluating Financial Incentives



value of the proposed financial incentive. Step (c) is important because the determination of an appropriate incentive generally involves negotiation with a private group: for the government to negotiate effectively, it must know the positions of its bargaining partners. Steps (b) and (c) are the subject of this report.

The Cash Grant Equivalent of Financial Incentives

All financial incentives involve present or future transfers between the state and the recipient firm. In the case of some of these incentives, such as outright grants, the transfers from the state are obvious and their value is readily computed. Their value to the recipient is simply the amount transferred. For purposes of comparison, we will restate the private value of all other financial incentives in "grant-equivalent" terms, i.e., the equivalent direct cash grant.

In contrast to cash grants, the other forms of financial incentives--concessional loans, loan guarantees, and tax incentives of various types--involve claims that will lead to future transfers from the state to the project sponsors, and in some cases, claims that will only be exercised if certain events take place. Since these claims involve future transfers of uncertain amounts, they are not captured in the budgetary process as current expenditures and often are totally ignored. However, the private market transforms these claims into cash grant equivalents by discounting the implied future cash flows to the present at an appropriate rate. This manner in which the private

market functions gives the recipients of future transfers command over current real resources.

Social cost/benefit analysis as applied in Canada employs a social discount rate that exceeds the private discount rate by an amount that reflects externalities associated with drawing funds from the local capital markets as well as from abroad. However, it is important to recall that social cost/benefit analysis is concerned with the time patterners of real benefits and real expenditures. Thus in evaluating financial incentives, it is essential to look through the veil of transfers to the actual time pattern of real resource expenditures. We shall demonstrate in part III that in many cases the current real resource equivalent of a commitment to transfer funds in the future can be estimated by discounting the transfer at the private market discount rate. This is shown to be equivalent to discounting the transfer, plus all of its related externalities, at the appropriate social discount rate. In cases when private value and public resource cost are equivalent, valuation principles derived from financial economics can be used appropriately as the basis of comparison between alternative financial incentive mechanisms for both public and private decision-makers.

Two paradigms from financial economics provide the means of assessing the value of particular types of intervention. This report will introduce the methodologies of Discounted Present Value by Components and Contingent Claims Analysis and demonstrate their applicability to valuing those types of interventions most commonly used to aid in the creation of employment. While the methodologies

are outlined in part IV, a quick summary of the analysis is presented here to provide an overall perspective on the valuing of various financial incentives.

In the case of concessional loans, the value to the firm is the interest subsidy built into the loan. Frequently, this is calculated as the difference between the government borrowing rate and the rate at which the funds are lent. This generally results in an understatement of the value of concessional loans to the firm since the borrowing rate that the firm would have to pay on an arm's length, commercial basis would typically be in excess of the government borrowing rate to reflect (a) the possibility of default and (b) the additional administrative cost involved in the loan to the private firm. Hence, the true value, or cash grant equivalent, of the concessional loan should be viewed as the difference between the commercial borrowing rate for the project in question and the rate at which the funds are lent via a government program. Of course, if the financial markets are deemed to be inefficient, the commercial rate would no longer be a valid indicator and it could be argued that some alternative rate should be used in the comparison. However, the appropriate rate will almost always be above the government borrowing rate and, in a well developed economy such as that of Canada, there is little reason to believe that the commercial rate will not be a sound reflection of credit risks and administrative costs for all but the smallest and most isolated projects.

Loan guarantees are much more difficult to value. They involve cash transfers only when the project in question cannot cover

its debt service. In other words, their value is a contingent claim, payable only when the project does not succeed. The cash grant equivalent of a loan guarantee is the expected value of the future contingent payoffs to the guarantee, discounted to the present by a risk adjusted discounted rate. If there was little or no likelihood that the project would fail, the value of the guarantee would be very small. Thus, the value of the loan guarantee is a function of the riskiness of the project itself and the financial soundness of the project sponsor. This makes it extremely unlikely that the true value of a loan guarantee will be captured in the budgetary process.

The value of tax incentives appears to be more readily computable than those of loan guarantees. Their value is the present value of future taxes foregone, discounted at a risk adjusted discount rate. Difficulties arise, however, when tax holidays or other tax provisions interact with other elements of the Canadian tax code so that there may be some partial or total offset between one set of benefits and another. In such cases, the value of the incentive will be less than it appears at first glance. A more serious problem arises with tax incentives in the case of foreign-controlled firms. In the case of U.S.-owned firms, for example, Canadian tax incentives that reduce the Canadian tax bill are ultimately offset by incremental U.S. taxes, unless the firm is in an overall excess tax credit position. Thus, there is likely to be some leakage between the cost to the Canadian treasury of the tax incentives and the benefit to foreign-controlled firms of such incentives.

Distortions in Private Sector Decision Making

The purpose of financial incentives is to change market (price) signals so that firms, in their own economic interest, will undertake investments and manage operations in ways that are more efficient from a social perspective. However, there often are wide disparities between the intended effects of government interventions and their actual outcomes. In order to formulate a set of interventions which minimize this gap, it is critical to understand more fully the impacts of incentives on the behavior of firms. This requires an understanding not only of the direct effects of incentives, but also of the effects that result from their interaction with the underlying business and investment climate and, in the case of foreign-controlled firms, with the tax system and incentive measures in the firms' home countries.

The distortions we focus on are divided into two categories, (a) those that lead to inappropriate selection of projects and (b) those that provide perverse incentives for operating decisions. With regard to project selection, we show that certain incentives bias firms' choices of projects in terms of (i) project life, (ii) capital versus labor usage, (iii) project riskiness, and (iv) project scale. Further, these distortions often contradict the underlying goal of creating permanent jobs. With regard to perverse operating incentives, many financial incentives lead firms to respond in a socially undesirable fashion to unfavorable competitive or technological changes, often jeopardizing employment through premature project

abandonment or failure to make the necessary investments to insure long-term employment.

Organization of the Report

This report is organized in six parts. Part II, which follows, describes various Canadian programs in terms of the four principal types of incentives described above. Part III discusses the concept of the social discount rate and shows how it can be applied to the unique case of financial incentives. Part IV generalizes the concept of the social discount rate into a structure of rates reflecting differences in the risks of various activities. Part V illustrates the mechanics of each type of incentive through a simplified project example and shows why the true cost of most financial measures exceeds the direct budgetary cost. The Discounted Present Value by Components and Contingent Claims Analysis paradigms are introduced and applied to the costing of various incentives. Part VI describes various distortions in private decision making that may result from the use of each major type of incentive measure.

II. TYPES OF FINANCIAL INCENTIVES EMPLOYED BY FEDERAL AND PROVINCIAL GOVERNMENTS

A detailed description of the various financial and other incentive measures to encourage job creation in Canada is provided by another part of this study. However, it is useful to relate these various specific programs to the generic categories of financial incentives that are analyzed in this report--direct grants, concessional or soft loans, loan guarantees, and various tax concessions. Table II-1 describes the types of financial incentives implicit in most of the major federal government agency programs. Table II-2 provides a similar description of financial incentives directed to and provided through special Crown Corporations. The "X" marks represent financial incentives provided to the private sector by Canadian Crown Corporations while the "O" marks represent financial incentives provided by the federal government to the Crown Corporations. In cases where both an "X" and an "O" are present, the Crown Corporation is acting as a financial intermediary, passing through some or all the financial incentives it receives from the federal government. Table II-3 outlines the various types of tax incentives related to job creation. From these three tables, it can be seen that all four forms of financial incentives are important elements in Canada's programs to encourage job creation and human capital formation.

Table II-4 attempts to describe the types of financial incentives that have been granted to certain individual projects within Canada. This analysis complements the program analysis presented in

Table II-1

Federal Government of Canada

Financial Incentives Directed Through Government Agencies

	Department of Industry, Trade & Commerce					Department of Regional & Economic Expansion
	Small Business Loan Act	SIAP (Shipbuilding)	DIPP (Defense)	Enterprise Development Program	Footwear & Tannery	Regional Development Incentive Act
Direct Grants	-	X	X	X	X	X
Concessionary Loans	-	-	X	X	-	-
Loan Guarantees	X	-	-	X	X	X

Table II-2

Financial Incentives Directed To and Through Special Crown Corporations

	Federal Business Development Bank	Export Development Corporation	Petro-Canada
Direct Grants	-	-	X (?)
Concessionary Loans	⊠	⊠	-
Loan Guarantees	⊠	⊠	-
Venture Participation	X	-	X
Insurance	-	X	-
Direct Ownership	O	O	O

Key X Crown Corporation gives financial incentive (e.g., loan guarantee) to private sector corporation.

O Crown Corporation obtains favorable financing (e.g., loan guarantee) from federal government.

⊠ Crown Corporation gives financial incentive to private sector corporation and obtains favorable financing from federal government.

Table II-3

Federal Government of Canada

Tax Incentives Directed to Particular Sectors

	Manu-facturing & Processing (General)	Small Business	Clothing & Footwear	R&D	Construction	Regions
Corporate Tax Reduction						
Tax Rate Reduction	X	X	-	-	-	-
Investment Credits	X (10%)	-	-	X (10%)	-	X (20-50%)
Employment Credits	-	-	-	-	-	X
Accelerated Capital Allowances	X (2 year S/L)	-	-	X (immediate)	-	-
Reduction or Exemption from Sales Tax	-	-	X	-	X	-
Personal Tax Reduction						
Tax Free Savings Plans	-	-	-	-	X (RHOSP)	-
Accelerated Capital Allowances	-	-	-	-	X (MIRB)	-

Table II-4

Federal Government of Canada

Financial and Tax Incentives Provided to Particular Projects

	Prince Albert Paper Mill	Churchill Falls Hydro-electric	Come-by-Chance Refinery	Glace Bay Heavy Water	Massey Ferguson	Bricklin
Financial Incentives						
Direct Grants	X ($5 Mill.)	-	X ($5 Mill.)	X ($5 Mill. + "advances")		*
Concessionary Loan	-	-	* ($30 Mill.)	*		*
Loan Guarantee	* ($50 Mill.)	-	$35 Mill. (?)	-		-
Venture Participation	* ($1.5 Mill.)	* ($15 Mill.)	-	* ($118 Mill.)		*
Tax Incentives						
Tax Exemption or Rebate	-	X	-	-	?	-
Accelerated Capital Allowances; Investment Tax Credits	(X)	X	(X)	(X)		(X)
Other						
Purchase Contracts	* (timber)	-	-	X (coal) * (steam)		-
Sales Contracts	-	(X)	-	(X)		-
Infrastructure	* (roads)	-	* (piers, wharves)	-		*

Key X provided by Federal government

* provided by provincial government

( ) non-concessionary, or of dubious value to the project

Tables II-1 through II-3 and, again, provides an overview of the relative importance of the various measures.

Some of the measures, such as accelerated capital allowances, involve government contracts to give up an (essentially) certain amount of taxes in the future. Others, such as reduced income tax rates, involve agreements to give up future taxes where the amount to be given up will be determined by the corporation's profits. Still others, such as loan guarantees and concessional loans where there is a significant probability of bankruptcy or forced reorganization, involve even more complex contracts to transfer funds in the future since the amount to be transferred will depend on the fortunes of the firm involved, but in a much more complex way than with a reduction in the tax rate.

An important implication of the complex and varied incentive programs currently employed in Canada is that government analysts must be provided with approaches that allow them to compare the value of different intervention mechanisms and to judge their likely impact on private sector performance. They not only face the problem of valuing anticipated public benefits associated with a particular project, but they must also choose among different individual interventions or packages of interventions. In the absence of a clearly defined analytical framework, it is very likely that errors will be made in valuing complex incentive packages and that private interests will be able to take advantage of government programs and obtain larger benefits than can be economically justified.

III. THE SOCIAL DISCOUNT RATE AND THE PUBLIC VALUATION OF FINANCIAL INCENTIVES

In evaluations of public projects, or of public support for private projects, the appropriate social perspective takes account of the project's impact on all sectors of society. In performing this analysis the costs and benefits from the project are measured in terms of the real resource inflows and outflows, each priced at the relevant marginal social cost. Included, of course, in the benefits of the project are any public goods (information, infrastructure, etc.) which it generates.

Evaluation from a social perspective determines whether a project's social benefits exceed social costs. If social benefits exceed costs, society will be better off if the project is undertaken. It then remains to be determined

1. if the project will be undertaken privately or if some form of public intervention is necessary; and

2. in the latter case, what is the appropriate magnitude of the intervention.

Thus, in addition to the social perspective, two other perspectives are relevant to a complete project evaluation. These are: the private perspective, which is necessary to deduce whether the private sector will take the project unassisted, and the budgetary perspective which is needed to assess the appropriate magnitude of a public intervention.

Figure I-1 presented a conceptual framework for evaluating financial incentives. Referring to that figure, it can be seen that

the public evaluation of a project is naturally divided into three steps, corresponding to the three perspectives we have described.

1. Evaluate the real resource benefits and costs of the project to determine whether it is socially worthwhile. This assessment should include real employment benefits as analyzed in another section of the Task Force report. (Social Evaluation)

2. Estimate the private worth of the project to determine whether a financial incentive is necessary to induce the private sector to undertake the project. (Private Evaluation)

If the social worth of a project is positive, i.e. social benefits exceed costs, but the private worth is negative, a subsidy whose private value is at least as great as the shortfall is required to get the project funded. From a budgetary perspective, the appropriate financial incentive is no larger than this amount. Thus step three of the evaluation is:

3. Set the financial incentive to minimize the subsidy, subject to it being sufficient to induce private sector action.

In following sections, we describe in detail the three steps of the methodology outlined above. First, we discuss social benefit-cost analysis, in particular the externalities captured by the social discount rate. Second, we explain private valuation and the functioning of capital markets, with emphasis on the private markets' ability to capitalize commitments exhibiting a multiplicity of time patterns of contingent cash flows. Third, given the budgetary objective of subsidy minimization, we show how private valuation techniques can be used to calculate the minimum sufficient incentive. We also show that under certain conditions the real resource equivalent of a subsidy is

independent of the form of the financial incentive, i.e. from a social perspective, the real resource cost is the same whether the subsidy is structured as an immediate cash grant, a stream of cash payments, a reduction in taxes, a concessionary loan, a loan or equity guarantee or a direct investment.

Resource cost equivalence does not imply that the public analyst is indifferent among the forms a subsidy may take: different forms of financial intervention may induce different managerial incentives which affect the selection and management of projects by private entrepreneurs. These managerial incentives and their implications for the public evaluation of financial interventions are discussed in Section 6 below.

The Social Evaluation of Projects

In evaluating public interventions in private projects, Canadian analysts apply social cost-benefit analysis using the "social discount rate methodology." The social discount rate methodology, which is based on the work of Arnold Harberger, is an operational procedure which allows planners to account for certain system-wide externalities associated with raising capital in a closed (or partially open) economy.* In this section we briefly describe the

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*The approach is outlined in A. Harberger [1972]. See L. Sjastad and D. Wisecarver [1977] for a discussion of some of the arguments surrounding the approach. The best known application of the Harberger approach to Canada is Jenkins [1977]. Burgess [1980] provides an alternative set of estimates.

application of the social discount rate to the social evaluation of projects.

Project Description. Consider a project generating a stream of real benefits (valued at appropriate marginal prices) of y dollars per year forever and requiring an expenditure of K dollars today. We assume that K is the real resource cost of the project, i.e. the capital inputs to the project are not mispriced.

The stream of benefits y from the project is divided into three categories. First, there is the private after tax stream of profits a private investor receives; we denote this stream $(1 - t)v$, where v is before tax profits and t is the tax rate on corporate income. Second, there is the stream of tax revenue collected from the project: this is denoted tv. Third, there is the stream of all other externalities associated with the project, valued at appropriate marginal prices: these are denoted x. Social benefit-cost analysis counts all benefits generated by the project, thus

$$y \equiv x + tv + (1 - t)v$$

Although not relevant to the social evaluation of the project, it is important in later stages of the evaluation to recall that benefit stream $(1 - t)v$ accrues to the private owners of a project; the streams x and tv accrue to the public at large.

The social discount rate ω measures the real opportunity cost (foregone stream of benefits) of pulling 1 dollar out of other uses today and applying it to a project. Comparison of the stream of

benefits from the project (y) and the stream of foregone benefits from the capital resources invested (ωK) determines whether the project is worthwhile. If

$$y - \omega K > 0 \qquad (1)$$

then the project on balance deserves to be undertaken. Equivalently, the per-dollar foregone stream of benefits ω can be used to discount y; the social test of the project is then

$$\frac{y}{\omega} - K > 0 \ .$$

Clearly, ω, the stream of foregone benefits per dollar drawn from general capital resources today is an important quantity in the social evaluation of a project. The Harberger social discount rate provides an estimate of this social opportunity cost. In the next section, we outline an abbreviated version of Harberger's social discount rate analysis; our purpose is to indicate the major components of the social opportunity cost of funds in the Canadian context.

Derivation of the Social Discount Rate. The major premise of social discount rate theory is that raising funds in the capital market creates externalities which are not reflected in the market's required rate of return. These externalities arise primarily because, in a partially closed economy, funds drawn from the capital markets displace projects which would have paid taxes, and change foreigners' perceptions of risk and hence the cost of foreign borrowing.

The relevant measure of the openness of the economy is the extent to which it draws on foreign borrowing or investment at the margin. This, in turn, depends on the size of the economy relative to world capital markets, the existence of explicit barriers to capital flows, and sovereign risk. By all three standards, Canada is among the most open of all economies, but given the proportion of total Canadian claims held by foreigners, it seems reasonable to assume that Canada faces a rising marginal cost of foreign funds, and thus has a social opportunity cost of capital different from the private market rate.

In the social discount rate methodology, it is assumed that at the margin, the capital market draws its funds from three sources: displaced projects, foreign borrowing or investment, and increased saving. The proportion of marginal funds drawn from each of these sources depends on their relative elasticities with respect to the interest rate: in equilibrium, it is well known that the private market will tend to equate private rates of return (adjusted for risk) across all sources. However, social rates of return on funds from different sources differ from private rates because of taxes and other externalities.

To illustrate, consider the project described in the previous section, in an economy where the current market interest rate is r. For simplicity, we assume that all benefit streams including profits have been restated as certainty equivalents; thus r is a risk free rate.

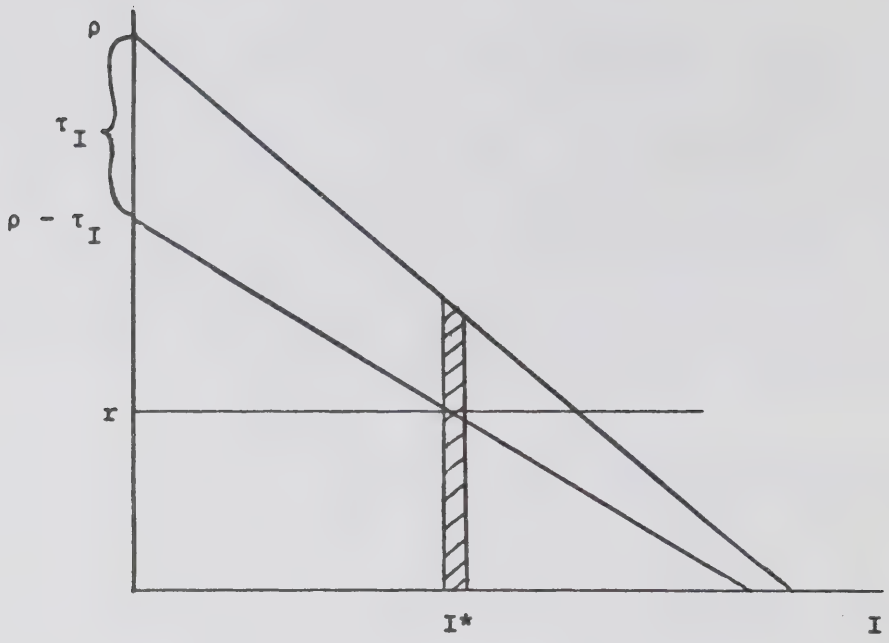
Private valuation methods, which we will return to later, dictate that the project will be undertaken privately if $v(1 - t) - rK > 0$ or equivalently if $v(1 - t)/r - K > 0$. From a social perspective, after-tax profits, taxes and other externalities are all counted as benefits; however, externalities associated with project displacement and foreign investment require a different discount rate to be used in the social evaluation of the project. Two factors which lead the SDR to diverge from private market rates are (1) project displacement, and (2) the impact of increasing foreign claims.

Displaced Projects. Some fraction of the resources needed to build the project will be obtained by displacing other projects within the economy. The primary externality associated with a displaced project is the investment tax (i.e., corporate income and turnover taxes) not collected. Define ρ as the before tax rate of return on a dollar of investment and τ_I as the sum of all taxes on a unit of capital. Figure III-1 depicts ρ and τ_I as functions of total investment I; $\rho - \tau_I$ is the marginal rate of return to private investors after corporate tax payments.

The level of investment I* is determined by the intersection of the schedule of after tax returns $(\rho - \tau_I)$ and the market interest rate (r). An increase in r will cause some private projects to be foregone, and will free up capital resources for some other use. From the public standpoint the per dollar opportunity cost of these funds is the sum of (1) the rate paid to private investors for use of the

Figure III-1

Relationship Between Private and Social Discount Rates



funds (r) plus (2) the tax not collected on the foregone marginal investment (τ_I).

Suppose at the margin 50% of capital raised is taken from displaced projects and 50% is new capital drawn in from abroad.* Then

*The exact weights of marginal domestic and foreign finance are not known and any attempt to estimate them is beyond the scope of this study. However, the 50/50 assumption is not implausible for Canada. See G. Jenkins [1977] and Burgess [1980] for two differing estimates of these weights.

the portion of the social opportunity cost of K that is attributable to displaced projects is

$$k_d = (r + \tau_I)(.5K) \ .$$

Foreign Source Capital. In a closed economy, absent other externalities (e.g. changes in consumption), the social opportunity cost of real capital resources is $r + \tau_I$. In a partially open economy, some fraction of new capital raised at the margin flows in from abroad. This inflow reduces displacement effects, but, in a sovereign state such as Canada, there are externalities associated with increasing foreign source capital.

We assume that foreign investors perceive a risk of unfavorable political action against their holdings. (Examples: discriminatory taxation, expropriation, exchange controls.) It is reasonable to suppose that their perception of risk increases with the total size of foreign holdings within the country.* As a result, we assume that the cost of foreign funds to Canada is an upward sloping function of foreign claims outstanding. (See Figure III-2a.)

It follows that the sourcing of funds from abroad has two costs: (1) the direct cost (less incremental withholding tax) and (2) the incremental impact on the cost of other foreign capital

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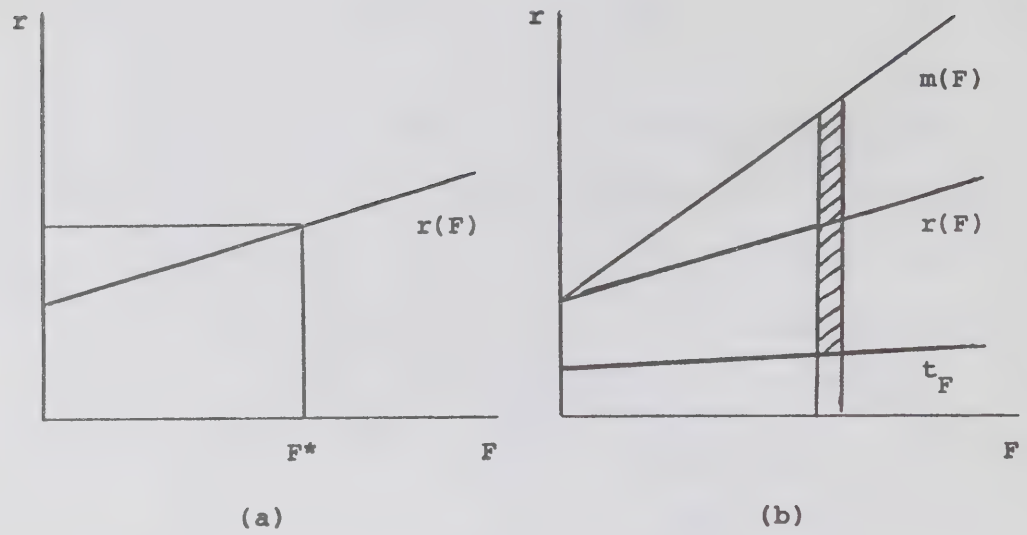
*For small changes in the size of the economy as a whole. Over long periods, this risk is more likely to be related to the fraction of total claims on the country held by foreigners.

**In practice, of course, these taxes will depend on the form of foreign investment. For portfolio investment, t_F will represent

Figure III-2

Domestic and Foreign Borrowing Schedules



inflows. Both costs are reflected in the function m derived from r (see Figure III-2b). The marginal cost of new foreign investment is higher than the direct cost (m > r). Given the assumption that

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withholding taxes on dividends and interest payments. For direct foreign investment, t_F will reflect all Canadian taxes incremental to the normal Canadian income tax--primarily the withholding tax on remittances of various types. To the extent that this tax is deferred on reinvested profits, t_F is reduced, but r and hence m (net of corporate taxes) on the same investment are reduced by an equivalent amount. One case where r and t_F will not move together is where the incremental tax on profits remitted from Canada is collected by the U.S. (or other non-Canadian) treasury as will be the case whenever the effective Canadian tax rate, including the effect of accelerated depreciation and other tax abatements, including withholding taxes is less than the U.S. rate and the U.S. firm is in an excess foreign tax credit position. See Thomas Horst [1977] and Michael Adler [1974] for further discussion of this latter point.

50% of new capital raised at the margin is drawn in from abroad, the portion of the social opportunity cost of K attributable to foreign sourcing is:

$$k_f = (m - \tau_F)(.5K) \ .$$

where τ_F is defined as incremental withholding taxes collected from foreign investors.

The Social Discount Rate. The impact of a project costing K on marginal capital resources is summarized in Figure III-3. The two schedules are constructed so that 50% of K is raised through displacement of private projects at an annuitized cost $(r + \tau_I)(0.5K)$ and 50% of K is raised through new investment from abroad with annuitized cost $(m - \tau_F)(0.5K)$. An ex post equilibrium rate r* prevails in the economy.* It is important to emphasize that Figure III-3 reflects the marginal impact of any new project using capital resources in this economy. Private investment has exactly the same displacement and marginal cost effects as public investment.** The

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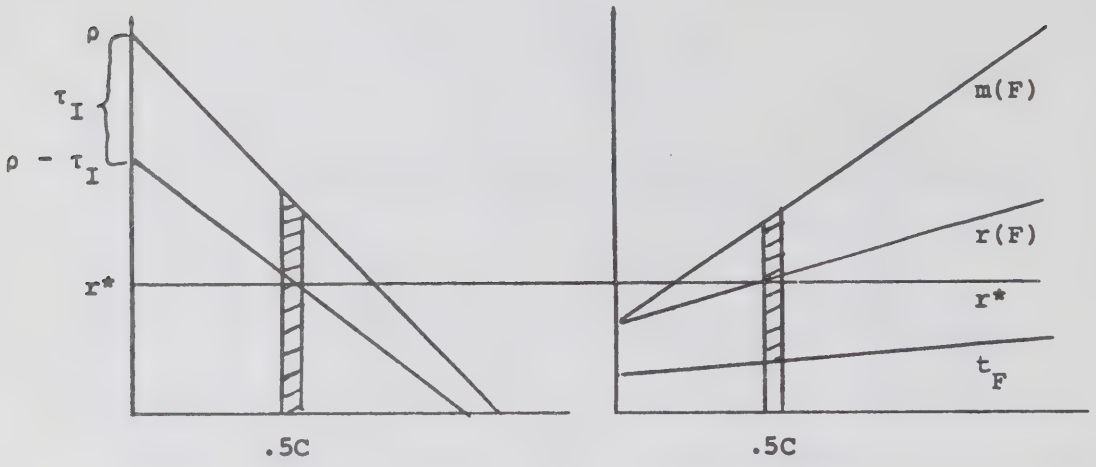
*Again, recall we are abstracting from risk and assuming that all flows are stated as certainty equivalents.

**Further, and perhaps more surprisingly, the determination of the appropriate social discount rate does not depend on whether the project in question is undertaken by a domestic or foreign firm. What is important is the extent to which a project increases Canada's access to world capital markets, i.e. the extent to which it reduces the slope of the foreign borrowing schedule in Figure III-3b. There is no reason to assume that this will depend on how the project is financed or where the equity owners reside. Thus, any differences between Canadian and foreign owned firms should be reflected in cash flow adjustments reflecting different taxes, for example.

Figure III-3

Determination of Domestic Interest Rate
from Domestic and Foreign Borrowing Schedules



key difference between public and private investment is that private investors do not take externalities into account in making investment decisions; public decision-makers, on the other hand, because of their responsibility for aggregate social welfare, must be interested in externalities created by public interventions.

The total annuitized social cost of a project costing K can be calculated by adding up the social opportunity costs of funds drawn from displaced projects and from abroad:

$$\text{Total Cost} = (r + \tau_I)(.5K) + (m - \tau_F)(.5K)$$

This amount can be re-expressed as the current resource cost K times a weighted average of the per dollar opportunity cost of funds drawn from each source.

$$\text{Total Cost} = \{.5(r + \tau_I) + .5(m - \tau_F)\}K = \omega K \ .$$

The bracketed term is ω, the foregone stream of benefits resulting from \$1 being drawn out of the general pool of capital resources today. Equivalently, ω can be used to discount y, and the discounted value compared to the capital cost K. However, we emphasize that the social discount rate ω is correctly applied only to real resource inflows and outflows from a project. In particular, the capital cost K must measure the value of real resources drawn from the economy today as a result of the project's construction.

Private Valuation

If the proposed project passes the test $y/\omega - K > 0$ then society benefits if the project is undertaken. However, public intervention is justified only if the private sector will not take the project unassisted. Recall that one element of the project's benefit stream y was the stream of private after tax returns $(1 - t)v$, where t was the normal* tax rate on corporate income. For simplicity we assumed that $(1 - t)v$ was expressed as a certainty equivalent.

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*I.e. before tax concessions specific to the project.

The private sector evaluates investment opportunities according to a net present value test. Given well-functioning capital markets, the project is undertaken if

$$\frac{(1 - t)v}{r} - K \geq 0 \ . \qquad (2)$$

If a socially worthwhile project also passes the private market test no public intervention should be necessary.*

On the other hand, if the project fails the private market's test, public intervention is necessary to get the project funded. To reverse the private sector's decision, the project must get a subsidy greater than or equal to the net present value shortfall D (D equals the quantity on the left hand side of inequality (2)). The private sector then considers the "base" project plus subsidy (S) as a new project which passes the net present value test and deserves to be undertaken:

$$\underbrace{\frac{(1 - t)v}{r} - K}_{D} + S \geq 0 \ . \qquad (3)$$

Function of the Capital Markets. In a well-functioning capital market the subsidy S can be constructed in an infinite number of ways. It may be an immediate cash grant to the project or a stream of deferred cash payments, or take the form of tax reductions (rate

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*Apparent exception: substitution of technology and/or location; bribes. In this case have to consider incremental private returns between operational alternatives.

decrease, expense deduction or tax credit), concessionary loans, or loan or equity guarantees. Whatever form the subsidy takes, the private capital markets will:

1. evaluate the time pattern and risk characteristics of the cash flows, including any contingent claims built into the contract;

2. assign the subsidy a value in today's dollars.

When the subsidy's value has been assessed it can be "intermediated" through the capital markets, that is, the subsidy cash flows can be sold, pledged as collateral, used as the basis for a common stock issue or otherwise traded for current resources of equivalent value. With the capital markets as intermediary, even risky or contingent claims to public resources in the future can be applied to purchase real resources today.

The capital market's efficiency in intermediating claims implies that an appropriate level of private investment can be induced through a variety of contractual mechanisms. The questions then remain:

1. what magnitude of financial incentive is efficient from a budgetary perspective; and

2. what form(s) of financial incentive induces the private sector to select and manage projects in ways that are consistent with public goals?

Budgetary Evaluation

In principle, the ability of society to subsidize worthwhile projects is unlimited. In fact, the secondary effects of transfers are not neutral, nor is it in the public interest to overcompensate

private entities for undertaking public programs. Therefore subsidies to private enterprises should be designed to minimize the value of resources transferred. The budgetary perspective seeks to conserve public resources by identifying the minimum subsidy which is sufficient to induce the desired private action.

From a budgetary perspective it is also important to identify cases where leakages or other market imperfections cause the value of what is received by the enterprise to be less than the value of real resources forgone by the rest of society. In such cases, financial incentives which minimize the difference between what is paid out and received are preferred.

From the private sector's decision rule (Eqs. [2] and [3]) it is evident that the minimum sufficient subsidy's value (denoted S*) is equal to the private net present value shortfall (D):

$$\frac{(1 - t)v}{r} - K = D = S^* \ . \qquad (3)$$

However, because of capital market intermediation, the minimum sufficient subsidy value can be translated into an infinite variety of subsidy contracts. These contracts may be vastly different in the time patterns and contingencies of the implied public commitments.

Given the multiplicity of possible contractual forms for a financial incentive, it is important to know whether from a public perspective some contractual forms (e.g. deferred subsidies) are preferred over others. There are two reasons for a public analyst to prefer one form of subsidy over another:

1. the form of the contract may make private decisions more or less consistent with public goals ("incentive effects"), or

2. the resource cost of the subsidy may be higher or lower under some contractual forms as opposed to others.

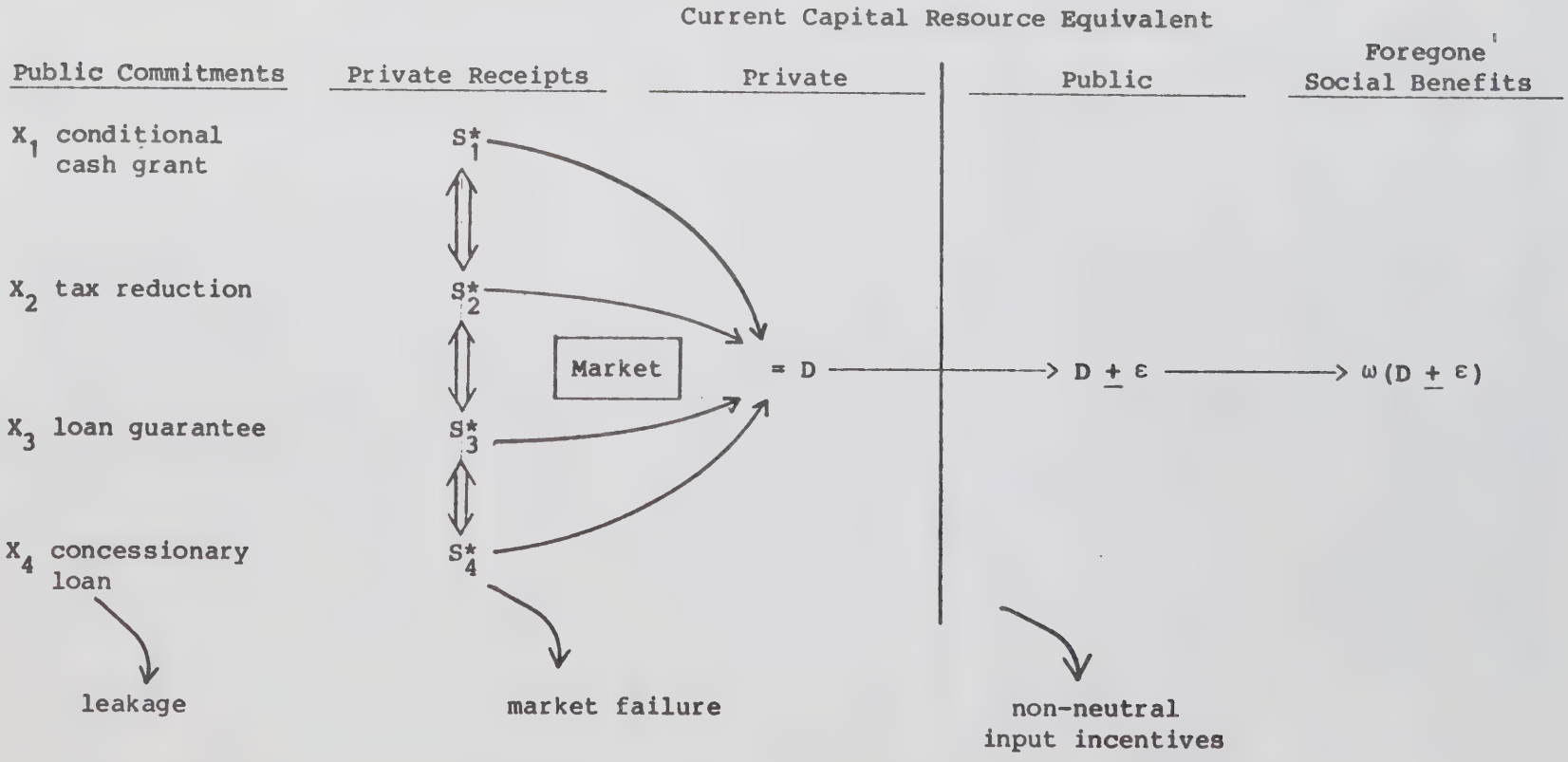
The "incentive effects" of various subsidy forms are discussed in Part VI of this report. In the remainder of this section, we address the issue of when the social opportunity cost of a subsidy is independent of its particular contractual form.

Figure III-4 diagrams the transmission of a subsidy from the public to the private sector; the conversion of the subsidy's contractual claim on future resources into a claim on current real resources via the capital market; and the translation of the private resource value into a social current resource equivalent. The private resource value of the subsidy may differ from the social real resource equivalent if some of the capital inputs to the project are mispriced in the market. The stream of foregone social benefits resulting from the subsidy is ω, the opportunity cost of capital, times $D \pm \varepsilon$, the current real resource equivalent where current resource inputs are valued at their appropriate marginal costs. We want to know when the social opportunity cost of a subsidy is independent of its particular form, i.e., when is the form of the subsidy neutral from a resource cost perspective and public analysts free to choose contracts solely on the basis of incentive effects?

Figure III-4 shows that non-neutrality may arise at one of three points. First, as already mentioned, the amounts paid out by the Treasury may be greater than amounts received by the ultimate

Figure III-4

Transmission of Subsidy from Public to Private Sector;
Impact on Current Capital Resources and Foregone Benefits



private sector recipient. These cases of "leakage" frequently arise when a foreign government indirectly taxes the corporation's income from the subsidy. Leakages and methods of structuring financial incentives to avoid leakage are discussed in more detail in Section VI below.

The second case in which the form of the subsidy may make a difference is market failure. In this case, the subsidy's recipient cannot convert the claim into equivalent current resources through capital market intermediation. We emphasize that in Canada's highly sophisticated financial markets the market's failure to intermediate a claim would be extremely rare and extraordinary occurrence. Market failure would be predicted only in cases where control of the enterprise was at issue (as in a small closely-held business with large capital needs) or where interdependencies between project outcomes and financing sources are present.*

That claims to future cash grants (e.g. DREE grants to small businesses) are heavily discounted by the private sector is not in itself evidence of a capital market failure. In the case of DREE grants, receipt of the deferred subsidy generally depends on the survival of the enterprise and may also be conditioned on the enterprise's technology being proved feasible and marketable. Lenders must take into account all risks having impact on the credit they assess; if the probability of a venture's failure is high and receipt

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*Such interdependencies are usually political in origin. Cf. Tembec Forest Products for an example.

of the deferred cash grant is contingent on success, then the real resources the enterprise can command today on the basis of its subsidy claim will be only a fraction of the face value of the grant.

The final case in which the contractual form of the subsidy may have an impact on its resource cost is the case where capital inputs to the project are mispriced. The subsidy form will then still be neutral if it does not affect the enterprise's choice of inputs (i.e. choice of technology, location, etc.). The subsidy form will be non-neutral in its resource cost effects if it induces managers to "tilt" either for or against the mispriced inputs.

Although there are resource cost implications in the effect the subsidy form may have on input and output configurations of a project, these impacts are most efficiently analyzed under the heading of incentives to managers to select or manage projects in socially sub-optimal ways. Except in cases of leakage or market failure, a subsidy is neutral in its social resource cost implications, <u>except for incentive effects on managerial decisions</u> both pre and post the granting of the subsidy.

The dichotomy between incentive and other resource cost effects leads us to recommend the following operational procedure for subsidy evaluation (the procedure assumes that evaluations of the project have been made from both the social and private perspective, and that a subsidy is both desirable and necessary):

1. Determine S*, the minimum sufficient subsidy value. construct a financial incentive to have private value S*. (Check no leakages or market failures are present.)

2. Then go back to social evaluation of the project to see if any inputs (or outputs) are mispriced.

3. From analysis of incentive effects, see if the proposed financial intervention causes tilt for or against the mispriced input(s).

4. If necessary, modify the financial form of the subsidy or include covenants to neutralize bias.

This procedure ensures that the public obtains the maximum possible benefit from the project.

To this point, we have discussed social and private discount rates as if each were a single number. However, it is generally accepted that private markets reflect a schedule of rates which is a function of the risk of the asset in question. There are compelling arguments for viewing social discount rates as a similar schedule. In the following section, we show why this is the case and derive an illustrative schedule of social discount rates.

IV. THE SOCIAL EVALUATION OF RISK

Most public and private investments have elements of risk associated with their outcomes. However, it is an accepted doctrine of both public and private finance that investments whose risk tends to disappear when aggregated over all society should be evaluated based on the same rate of return standard that is applied to riskless projects.

Some theories of public investment policy have been based on the view that all risks disappear at the level of society.* This view implies that all public projects (or other interventions in private markets) should be held to the same rate of return criterion. We believe that this point of view is false; that there are risks to which society as a whole is subject. Furthermore, government investments and interventions which tend to increase uncertainty in the economic system as a whole, should, we think, have higher anticipated payoffs than those whose outcome is certain (at the level of society).** Conversely, public ventures which have the effect of lowering systemic uncertainty, even if risky in and of themselves, should be subject to lower rate of return standards than a riskless project.

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*This point of view is taken by Arrow and Lind [1970].

**This point of view was first articulated in the public case by Bailey and Jensen [1972].

Although the concept of systematic risk is well-known and much studied in the context of private financial markets,* an example serves to illustrate its relevance to public sector investment decisions. First of all, consider an open economy whose production is concentrated in a sector subject to world market fluctuations. (Specific examples of concentrated economies would be Chile in copper, Alberta in oil and natural gas, Saskatchewan in wheat, etc.) Should the government evaluate public subsidies to the dominant sector differently from subsidies to industries or activities in other sectors?

We would argue that it should. As one risky activity becomes more important to the economy, the well-being of the population comes to be more and more exposed to uncertainties relevant to that industry in particular. Rational risk aversion implies that individual members of society would be willing to pay to reduce their exposure to uncertainties beyond their control. Diversification of the economic base is a way to reduce overall risk: the impact of adversity in one market may be partly offset by normal or favorable developments in another.

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*The explicit definition of systematic risk used in most current work in finance is the result of the extension of Markowitz's [1959] pioneering work on portfolio theory to a theory of capital market equilibrium (Capital Asset Pricing Model) by Sharpe [1964], Lintner [1965], and Treynor [1965]. See E. Fams [1976] or virtually any recent text in corporate finance or investment for a statement of the Capital Asset Pricing Model.

If diversification is identified as a desirable social goal, then an important aspect of public policy is the assessment of an appropriate social risk-return tradeoff. Operationally, this means:

1. determining the level of society at which diversification should be implemented; and

2. establishing a functional relationship between the (social) riskiness of a project or financial transfer and the discount rate applied to it.

In general, the appropriate level of diversification is the national economy. Two principles are important to this judgment. First, an economy usually becomes concentrated in a particular industry because of some intrinsic advantage it has in the world market. Diversification goals generally run counter to a country's or a region's comparative advantage. It is therefore optimal to undertake diversification at the highest level of the economy so that economic subunits (regions, etc.) are left free to specialize to achieve maximum efficiency.

The second important principle is that the government should not try to do what individuals can better achieve for themselves through the capital market. Risk reduction through diversification can be achieved by individuals through their portfolio investments (including indirect claims such as pensions and social security). In this way a farmer in Saskatchewan can have interests in energy resources in Alberta, fish processing in Vancouver, and manufacturing enterprises in Quebec, Ottawa and Los Angeles. The Saskatchewan resident does not necessarily need energy, fishing and manufacturing enterprises to be established in his province to obtain diversification

benefits from them. This implies that risk should be assessed relative to the broadest set of capital markets accessible to local investors.

For the reasons just discussed we would argue that government efforts are best directed at diversification relative to the national, or, to the extent borders are open, even the continental economic base. This implies that the appropriate public trade-off between systemic (i.e., social) risk and return is that implicit in asset correlations and rates of return in the private capital market. The government, in seeking to discover the social risk inherent in a particular project or industry, should as a first approximation, look at how prices of closely related ventures covary with the total of all market assets available to Canadian investors.* It should then consider historical relationships between social risk and return which have prevailed in the same capital market. Consistent with our analysis in the previous section, the appropriate discount rate to apply to (the expected value of) government financial transfers is the rate of return required by the market on assets of comparable social risk (see Figure IV-1). The appropriate social discount rate applicable to net benefit streams is the risk adjusted market rate further adjusted to reflect capital market externalities arising from foregone projects and foreign source investment.

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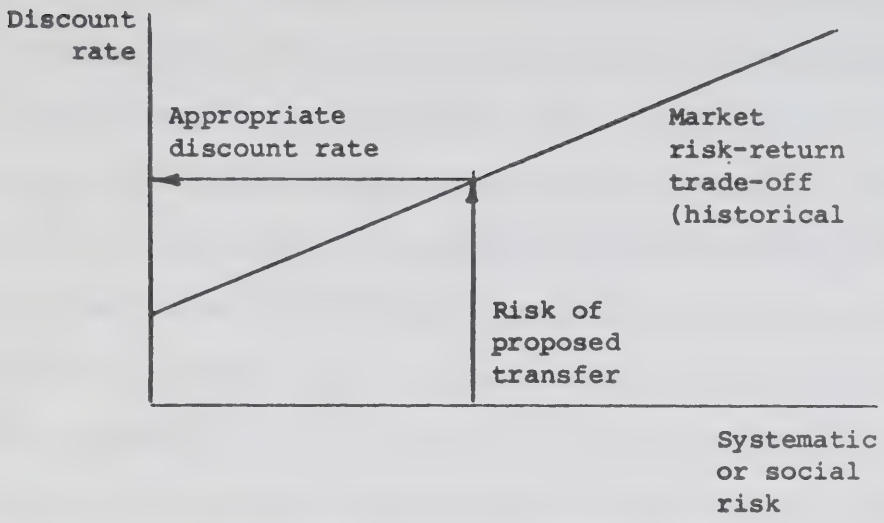
*The relevant social risk will be very similar to systematic risk from a private perspective if externalities not included in private evaluations are highly correlated with financial returns. With income taxes, the correlation is almost perfect and with most other externalities it can be assumed to be very high.

Figure IV-1

Relationship Between Risk and Return



We believe that the social risk of projects and the appropriate social risk-return tradeoff can best be estimated through observation of covariances and asset pricing relationships in the private capital markets. Use of market criteria will, at the very least, ensure that public interventions do not replicate (at higher cost) the risk-spreading function of the private capital markets. However, Canada's special circumstances including (1) her economic relationship to the United States and (2) her political structure as a federation of provinces make it necessary to discuss certain limitations of the capital market measures as they relate to the government's role in promoting diversification of Canadian product and labor markets.

First, because of Canada's integration with the U.S. economy and the essentially open border for capital market flows, systemic risk for Canadian investors is largely determined at the continental level. This means that Canadian investors face the same opportunities and thus will define social risk and the risk-return trade-off in the same way that American investors do. However, Canada, as a sovereign nation, has an interest in maintining some degree of economic diversity within the national boundaries. This is the same as saying there is a shadow value to the nation of industrial and financial autonomy which is not reflected in the capital market discount rate structure.

Operationally, this issue may be dealt with on two levels. Within the constraints of currently available information, the approach we advocate is:

1. to take industry correlations and the historical data on risk-return tradeoffs estimated for the U.S. markets; and

2. add to the rate structure a premium for Canada country risk.

This approach is discussed in more detail in the estimation section which follows. Residual national gains from diversification under this approach would be treated as an unpriced benefit and would be traded off against the cost of the proposed intervention in the standard way.

A more sophisticated approach requires estimation of the correlation of asset price movements and Canadian wealth. (Proxies for Canadian wealth might include (1) Canada GNP, (2) traded values of Canadian assets on the Toronto and New York Stock Exchanges, and

(3) measures of the Canadian dollar's relative purchasing power.) These estimates would be used to identify enterprises or industries whose "continental" social risk was radically different from their "Canadian" social risk; these would be candidates for potential government interventions to promote national diversification.

The second issue re diversification which is of particular importance to Canada is the conflict of interest which divides the provincial and federal levels of government. Even as Canada needs to preserve a degree of diversification in its national economy, provincial governments can equally well identify regional autonomy and diversification as among their legitimate goals.

Within the Canadian system, large cross-province transfers of income (through taxes, social security, etc.) are likely to create centrifugal political forces. For this reason, some degree of provincial economic autonomy is probably desirable. However, it is important to recall that diversification at the province level may detract from the overall efficiency of the Canadian economy. Provincial officials, with an interest in reducing the variance of their direct tax revenue, may positively evaluate and subsidize projects which would be better located somewhere else in Canada. Although a valid argument for diversification of job opportunities within some small thin labor markets can be made, in our opinion, projects whose case rests primarily on provincial diversification should be viewed with some suspicion and where possible, should be subject to careful scrutiny at the federal level.

In summary, there are economic risks which do not disappear in aggregate; the reduction of social risk via diversification is thus a legitimate goal of both public and private investment. The private capital market promotes diversification and risk reduction by requiring lower rates of return on projects which are less correlated with the market at large. However, because Canadian and U.S. capital markets are highly integrated, the market can only be expected to reward contributions to diversification at the continental level. The Canadian government may have a legitimate interest in promoting some additional diversification of the Canadian economic base; by a parallel argument, the Canadian provinces may seek to promote autonomy and diversification within their own provincial boundaries. Although these goals have some legitimacy given Canada's unique circumstances and political structure, it is important to remember that diversification within small economies exacts a price in the form of reduced efficiency. Over-enthusiastic pursuit of local diversification can lead to a severe curtailment of national wealth because of an economic base that is not competitive by world standards. Thus we believe that national and provincial diversification should be promoted with extreme caution and with full understanding of the cost. Use of continental capital market correlations to determine social risk and of the same market's risk-return trade-off to determine appropriate discount rates ensures that risky projects (and implicitly financial incentives) will be fairly valued on the basis of their contribution to aggregate continental risk. Actual estimates of the riskiness of different industries, the discount rates applicable to financial

incentives and a methodology for translating market risk-adjusted rates into social risk-adjusted rates are described in the following section.

Estimation of Risk Adjusted Discount Rates

We have already said that the relevant measure of risk for society is that portion of total uncertainty which does not get "washed out" at the level of the whole economy. In a well-functioning (i.e., fluid, frictionless) capital market, this so-called systematic risk is the only risk that investors will be compensated for bearing. Compensation for bearing systematic risk takes the form of higher average rates of return on securities having high correlations with market aggregates. Since the Canadian capital markets are closely integrated with those of the U.S., readily available rates for that market are good proxies for Canadian rates. A more explicit set of estimates for the various sectors of the Canadian economy as well as the overall economy are being prepared in another part of the study.

Long range studies of average rates of return on broad categories of securities in the U.S. financial markets have been conducted by Fisher and Lorie (1968) and more recently by Ibbotson and Sinquefield (1978). The Ibbotson-Sinquefield study, in addition to covering a longer time period (1926-1978 as opposed to Fisher-Lorie's 1926-1965), explicitly adjusted holding period returns for the effects of inflation. Results of the Ibbotson-Sinquefield study are summarized in Table IV-1.

Table IV-1

Average Rates of Return on Various Classes of Securities*

1926-1978

	Mean Annual Return**
Government Bills	0.0%
Long Term Government Bonds	0.9%
Common Stock Equities	8.7%

*All rates adjusted for inflation.

**Arithmetic mean of holding period yields.

Source: Ibbotson, Roger and Rex Sinquefield, Stocks, Bonds, and Inflation: Historical Returns 1926-1978; The Financial Analyst Research Foundation, 1979.

A widely-used measure of the social/systematic risk of a project, security or portfolio is the "β-coefficient." The β of an asset is most commonly defined as the slope coefficient obtained from regressing the asset's rates of return against rates of return on a broad-based index of the stock market, that is:

$$\beta_i = \frac{Cov(R_i, R_M)}{\sigma^2(R_M)}$$

$R_i \equiv$ (time series) rates of return on asset i;

$\bar{R}_M \equiv$ (time series) rates of return on the market index;

$\sigma^2(R_M) \equiv$ variance of market index.

Under this definition, nominally riskless government bonds have β's equal to zero; by construction, a market-value-weighted portfolio of all common stocks has a β equal to 1. Table IV-2 presents estimates of the β's of major industries relative to the U.S. common stock market. It is interesting and important to note that although there is a correlation between industry β's and common perceptions of industry risk (stability, cyclicality, etc.), the correspondence is far from perfect. Utilities, as one would expect from the way in which they are regulated, have a relatively low β, but so does the steel industry whose performance is sensitive to an uncertain business cycle as well as a variety of random external shocks.

It is straightforward to show that β's and rates of return (R's) on composite securities are linear combinations of the β's and rates of return of the underlying securities; equilibrium forces then dictate that a risk-return trade-off between β and R must perforce be linear. In Figure IV-2, we use Ibbotson-Sinquefield's historical rates of return on government bonds and common equities to locate the slope and intercept of the line; subject to all the usual empirical caveats, we feel that Figure IV-2 is a reasonable representation of the trade-off between systematic risk and return implicit in the asset pricing structure of the U.S. capital markets.

Table IV-2

Industry Betas

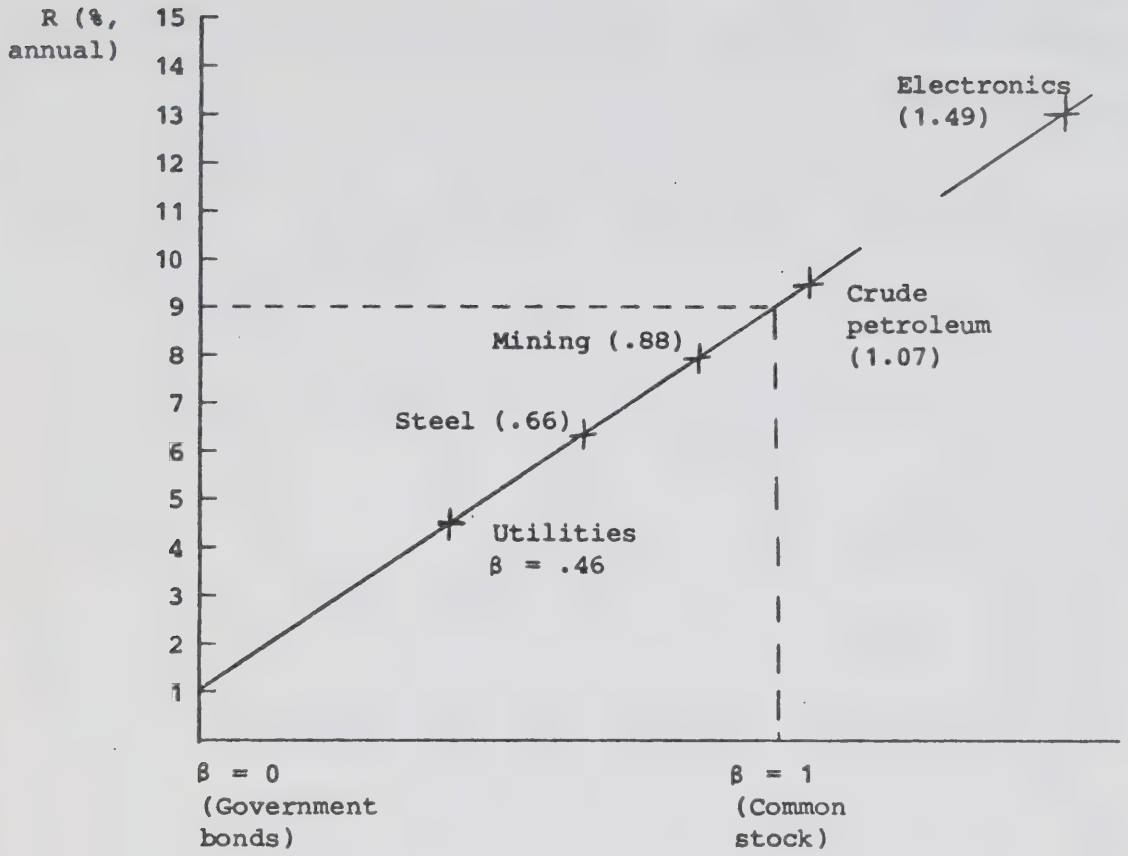
Industry	Beta
Electronic Components	1.49
Crude petroleum and natural gas	1.07
Retail department stores	0.95
Petroleum refining	0.95
Motor vehicle parts	0.89
Chemicals	0.88
Metal mining	0.87
Food	0.84
Trucking	0.83
Textile mill products	0.82
Paper and allied products	0.82
Retail grocery stores	0.76
Airlines	0.75
Steel	0.66
Railroads	0.61
Natural gas transmission	0.52
Telephone	0.50
Electric utilities	0.46

Note: These are asset betas. The effect of financial leverage on beta has been removed.

Source: U.S. Federal Energy Regulatory Commission, Testimony of Gerald A. Pogue, Williams Pipe Line Co., Docket Nos. OR79-1, et al., p. 74.

Figure IV-2

Risk and Required Return for Selected U.S. Industries



In a previous section, we indicated that, for a net borrower like Canada political risks perceived by foreign investors are likely to result in an upward sloping supply curve for funds sourced from abroad; this in turn has the effect of raising the equilibrium interest rate inside Canada. This hypothesis is supported by the empirical observation that official Canadian borrowers pay a slight premium over

the riskless rate in the Eurodollar market;* similarly, real Canadian government borrowing rates are generally thought to be roughly 1 percent higher on average than rates on comparable U.S. Treasury issues adjusted for U.S. inflation, although currently the relationship appears to be reversed.

Although we are not aware of any empirical studies addressing this issue, there is every reason to suppose that the country risk premium observed on low-risk instruments is carried over to the discount rate structure applicable to more risky investments. The arguments of moral hazard, absence of due process, etc. which would justify a country risk premium on short-term, low-risk credit transactions also apply to longer-term transactions including equity.** For this reason, we believe that the private market risk-return tradeoff in Canada is at least 1 percentage point above the U.S. line (line A, Figure IV-3). Subsequent empirical research may show that the Canadian line is not simply a parallel shift of the U.S. line, but, in fact, has a steeper slope (line B, Figure IV-3); however, at this point in time we have no evidence as to what the true slope of the Canadian line might be.

Line A of Figure IV-3 represents what, based on currently available information, we judge to be a reasonable trade-off of

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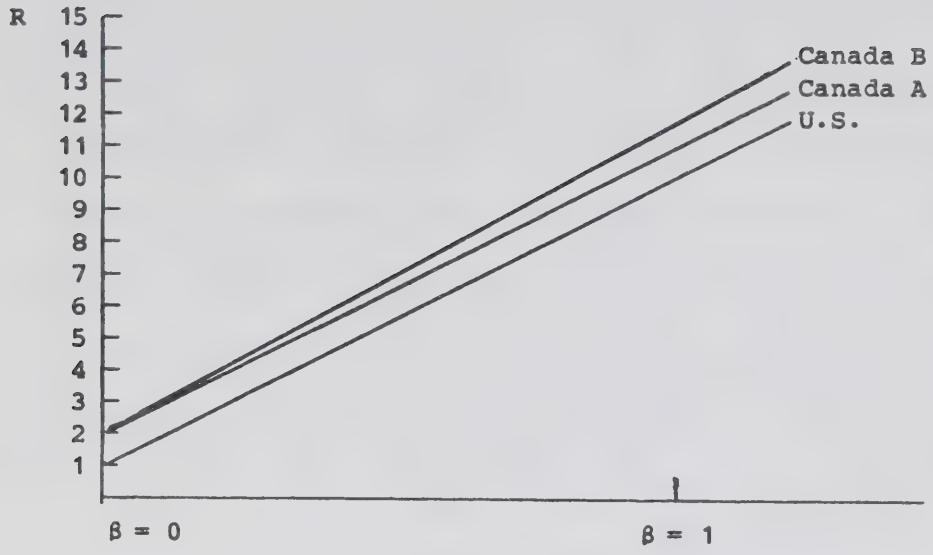
*Hydro-Quebec borrowed $1.2 billion in 1980 at 0.5% over LIBOR for 10 years.

**Lessard [1981] argues that the country risk premium will be an increasing function of the riskiness of the country's economy but a decreasing function of the covariance of external obligations with national income.

Figure IV-3



systematic (social) risk vs. return applicable to Canadian financial assets at this time. Financial incentives fall within our definition of an asset. We have already argued that the appropriate discount rate to use in valuing financial incentives is the market rate. Thus to value a particular financial incentive our methodology calls for

1. estimating the systematic risk (β) associated with the financial incentive (β will depend on the contractual form of the financial incentive, as well as on the systematic risk of the underlying project(s).)

2. reading off the discount rate appropriate to the β from the Canadian risk-return line.

The application of this methodology to specific incentives is discussed in Section 5 which follows.

Risk Adjustment: From Market to Social Discount Rates

We have shown that for the limited purpose of valuing financial incentives, it is sufficient to estimate private market discount rates adjusted for risk. However, the argument that systematic or social risk should be taken into account in project evaluations via a higher discount rate applies to public investment decisions as well as private ones. Having raised the issue of risk-adjusted discount rates in the context of social evaluations, we think it important to outline how risk-adjusted social discount rates might be estimated for Canada.

Recall that the major components of the social discount rate ω were:

ρ --the before tax rate of return on a marginal project; and

m--the marginal cost of incremental funds sourced from abroad.

As previously defined, ρ and m are rates of return on risk-free assets; they differed from the private risk-free rate because of taxes and externalities associated with political risk. In this section we shall discuss how ρ and m can be converted from single rates to schedules corresponding to a social risk-return trade-off. For the purpose of this exposition we shall assume that the weights in the social discount rate calculation are invariant across all risk classes of assets. This is probably not a strictly valid assumption; however, a full-blown theoretical analysis of the determinants of the weights lies beyond the scope of this project.

Estimation of ρ. The social rate of return on displaced projects ρ differs from the private rate because of taxes on investment. Our approach to estimation of a risk-adjusted ρ is

1. to start with the private market risk-return schedule (see line A, Figure 1); and

2. build up an estimate of ρ by imposing statutory provisions of the Canadian Tax Code.

A key assumption of this procedure is that marginal displaced projects have the same risk (β) as the public project being considered. This assumption appears to be a valid first approximation: it is consistent with society's maintaining a constant risk profile, and it reflects the fact that, in many cases, public interventions have the greatest displacement impact on the project's own industry (i.e., a publicly supported project may substitute for a socially less desirable private project in the same industry).

Figure IV-4 illustrates our methodology. To arrive at Figure IV-4b we used the following facts and assumptions about the Canadian Tax Code.

1. The tax on corporate income is 46%.

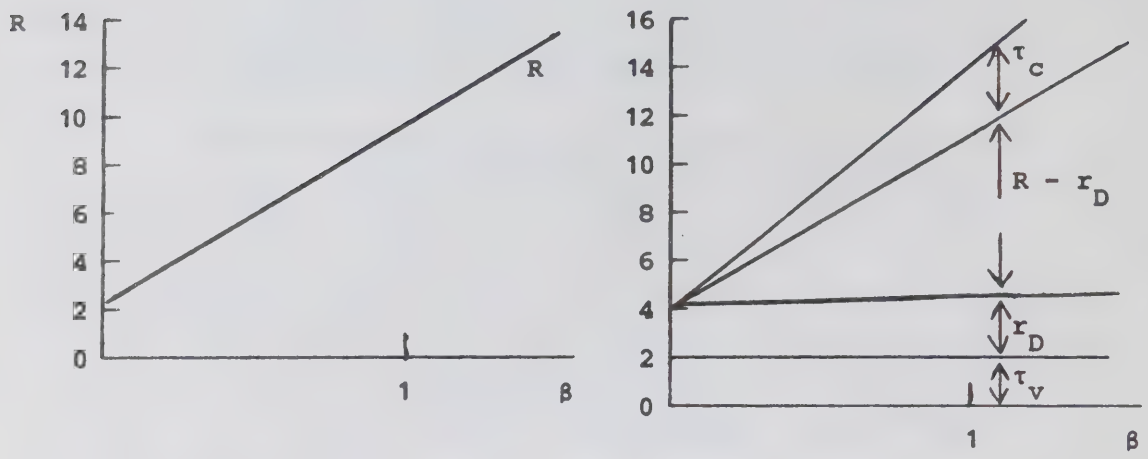
2. Interest on debt is tax deductible; a riskless ($\beta = 0$) investment is normally 100% debt financed; investments of average risk ($\beta = 1$) are on average 30% debt financed.

3. From (1) and (2), the corporate income tax is

$$\tau_C = 0.46(R - r_D)$$

Figure IV-4

Schedules of Private and Social Discount Rates as Functions of Risk



Private Discount Rate

(a)

Social Discount Rate

(b)

where

R ≡ the private market risk-return trade-off

r_D ≡ the portion of assets' total return going to interest payments

4. the corporate value-added tax is 5% of turnover; total turnover equals national income; we assume that national wealth is approximately 3 times national income, thus for an average project the value-added tax rate (relative to investment I) is

$$\tau_V = \frac{0.05Y}{I} = \frac{0.05}{3} = 0.01666... \approx 2\%$$

Figure IV-4b indicates that the social opportunity cost of displaced riskless projects is approximately 4%; the opportunity cost of displaced projects of standard risk ($\beta = 1$) is

$$\rho_{\beta=1} = \tau_V + R + \tau_C = 2 + 10 + 0.46(0.7)(10) \simeq 15\%$$

It is important to note that because β is scaled relative to the corporate equity market a standard risk ($\beta = 1$) project is somewhat riskier than the average industry. For example, consulting Table IV-2, trucking is the median-risk industry; the opportunity cost of displaced projects in this industry is approximately:

$$\rho_{\beta=.83} = 4 + 0.83(15 - 4) = 13.13 \simeq 13\% .$$

Estimation of m. The marginal social cost of funds sourced from abroad differs from the private cost because of the externality of sovereign risk. The political risk foreigners perceive to be associated with investment in Canada is not likely to be independent of the total amount of foreign claims outstanding. We previously argued that this would imply an upward sloping supply curve for riskless foreign funds; if foreigners also invest in risky Canadian assets the supply curve becomes implicitly a supply surface in the dimensions β (the risk of particular investment) and F (total foreign claims on Canadian assets). At this point, an algebraic analysis of m becomes more tractable than a geometric one: that is what we present here.

For simplicity, we hypothesize that the function $R(\beta,F)$ (the private market rate of return on assets of risk β, given aggregate foreign claims F) is planar in form:

$$R(\beta,F) = R_W(\beta) + \delta(\beta)F$$

where R_W represents the world required rate of return on assets of risk β (R_W may be proxied using the U.S. market line) and $\delta(\beta)F$ is the sovereign risk premium.

According to this representation, the sovereign risk premium, in addition to depending on total foreign claims outstanding (F) may also differ according to the social risk (β) of the particular asset in question. In our view the sovereign risk premium is likely to be an increasing function of the riskiness of the investment for a number of reasons. First, risky claims as a class may be implicitly more fixed and localized and thus more expropriable (e.g., claims to real property, natural resources, etc.). Second, it may be politically and juridically easier to alter the terms of proportional claims (for example, by changing the tax structure) than to change the terms of contractually fixed claims: to the extent risky claims tend to be proportional (e.g., corporate shares) they would bear a higher proportion of the risk of adverse political action. Finally, since sovereign risk reflects both the ability and willingness of society to transfer wealth to foreigners, it is likely to be an increasing function of the variance of national income. To a first approximation β measures a project's contribution to the variance of national

income, thus dollars invested in high β projects will tend to raise aggregate sovereign risk and may therefore command a higher risk premium.

Given the hypothesized form of $R(\beta,F)$, m, the marginal cost of foreign funds (including externalities) is

$$m(\beta,F) = R(\beta,F) + \delta(\bar{\beta})F$$

where $\delta(\bar{\beta})F$ is the average sovereign risk premium determined by the distribution of foreign holdings among various risk types of assets. The social opportunity cost of foreign investment in a risky asset is thus equal to (1) the Canadian private market's required rate of return $R(\beta,F)$ (including the sovereign risk premium $\delta(\beta)F$) plus (2) a premium determined by the average risk of foreign holdings.

Figure IV-5 graphs R and m as functions of F for $\beta = 0$ and $\beta = 1$ respectively. Note that, for the functional form assumed for $R(\beta,F)$, the adjustment from the private market rate to the social opportunity rate, given F, is the same for all levels of asset risk. In the Canadian context, we believe this adjustment may be on the order of 1-2 percentage points but, clearly, further theoretical and empirical work on the interactions of sovereign and systematic risk is necessary to refine this estimate.

Risk-Adjusted ω. Using the 50-50 weights previously assumed applicable to Canada, we can illustrate the calculation of a risk-adjusted social discount rate of the Harberger type. Table IV-3 shows the calculation of ω for $\beta = 0$ and $\beta = 1$ assets respectively.

Figure IV-5

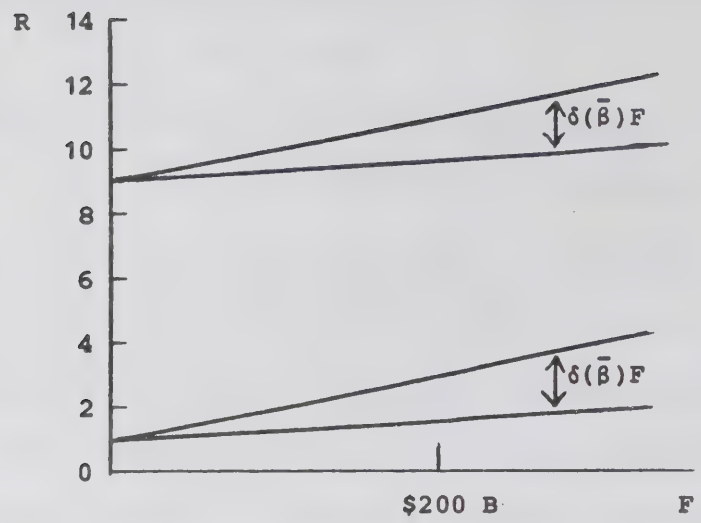


Table IV-3

Estimates of Canadian Discount Rates (in Real Terms)

	Riskless Project ($\beta = 0$)	Project of Average Risk ($\beta = 1$)
m	3-4%	11-13%
R_{Canada}	2%	10-11%
ρ	4%	15%
ω	3.5-4%	12.5-14%

Note: These represent real discount rates, i.e., they are not adjusted for the effect of inflation on nominal contracts.

(Recall that because of the way β's have been historically calibrated, a $\beta = 1$ asset is comparable to an average equity claim, and is in fact more risky than the average project or industry.) The estimates of presented in Table IV-3 appear reasonable for Canada; they can be usefully applied (in conjunction with Table IV-2 or some other set of β-estimates) to the evaluation of public projects and interventions having non-negligible social risk.

V. THE VALUATION OF FINANCIAL INCENTIVES

As noted in the introduction, the key principle of valuing financial incentives is that all future claims against the government should be quantified as cash flows and discounted to the present at a risk adjusted rate. When the recipient firm is able to capitalize these cash flows in the financial markets, a straightforward way to value the real resource cost is to discount the associated cash flows of the financial incentive at the private market rate applicable to future flows of equivalent riskiness.* The key considerations in this discounting process are illustrated in Figure V-1. First, the future cash transfers associated with each financial incentive must be identified. Second, given the characteristics of the cash flow in question, an appropriate discount rate must be selected. This will depend on whether the future cash transfers are risky or riskless. For riskless transfers the appropriate discount rate depends on whether future cash flows are fixed in money terms or indexed to the price level. For risky transfers based on pro rata claims to a project's profits (e.g. tax rate reduction), the discount rate depends on the systematic (social) risk inherent in the claim. Risky transfers of non-pro rata claims (e.g. loan guarantees) require a special

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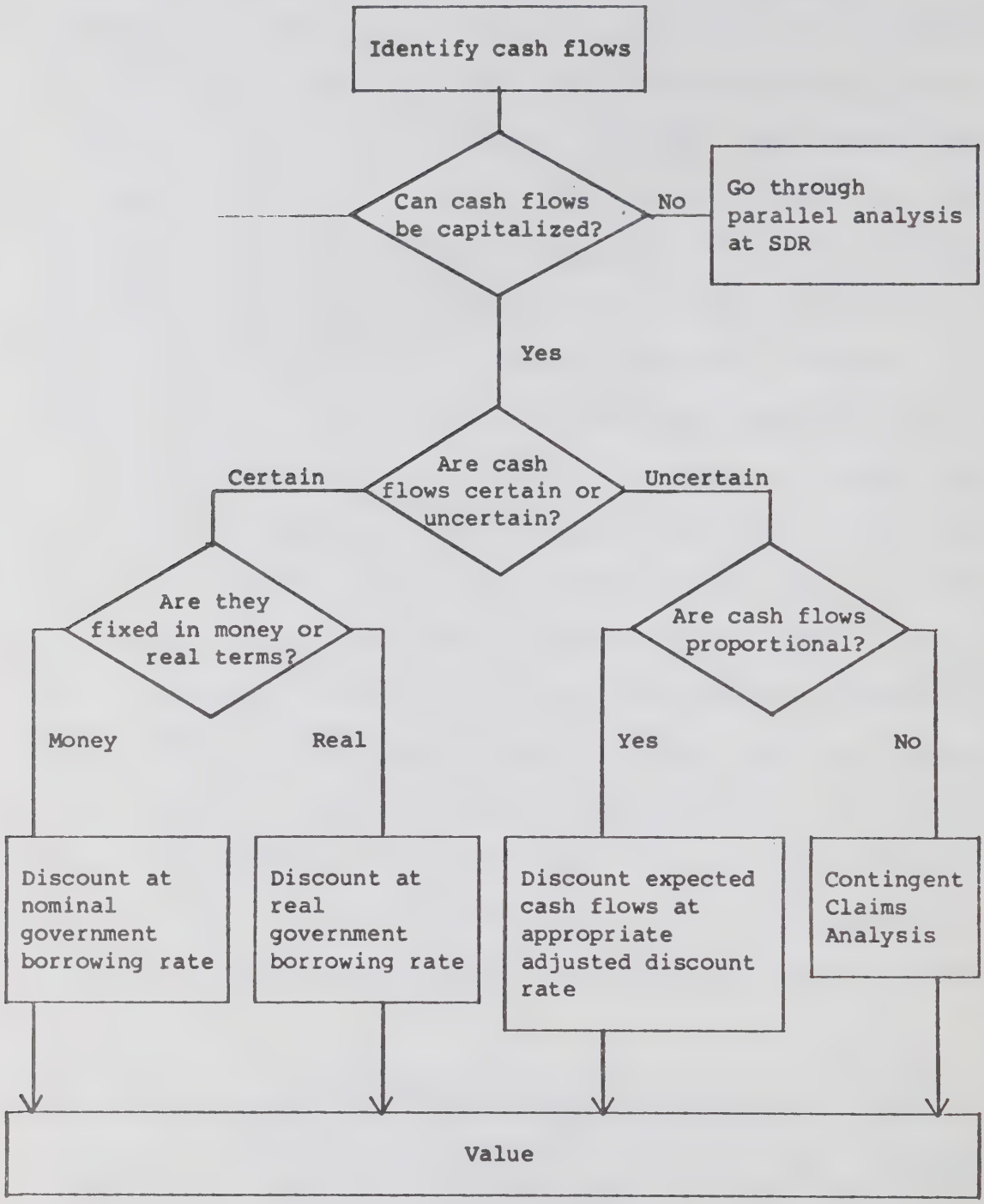
*Even if the real resource cost and private value of a financial incentive differ because of tax leakages, the appropriate cost and value is obtained by discounting the net of tax flows at the appropriate private market rate. Only in the rare case that the private firm cannot capitalize future transfers to any extent will it be appropriate to discount the net of tax transfer flows at the social discount rate, ω.

Figure V-1

Procedure for Selecting Appropriate Discount Rates



contingent claims analysis. Thus, using the methods set forth in this section, each major element of an incentive package can be valued in terms of a cash grant equivalent. The various elements can then be aggregated into a single grant-equivalent figure. Each of these steps is discussed below.

Valuing Financial Incentives--An Example

The valuation of financial incentives is illustrated by way of a hypothetical manufacturing project which receives various tax incentives. Table V-1 gives economic assumptions for a generic project in the manufacturing sector. The project has a capital cost of $10 million and will create 200 permanent jobs. A $2 million training program is necessary to qualify workers for the jobs; however, once workers are trained, competition in the labor market will prevent the company from recouping its training costs.

Following the four step valuation procedure introduced in Figure I-1, it is necessary to compute the present value of the project from a social perspective and from a private perspective and then value the (various) incentive package(s) from the private perspective. Since our objective here is to illustrate the valuation of incentive packages, we move quickly through steps one and two.

From a private perspective, the project has a net present value of -$992,000 and hence is not feasible. However, the after tax cost of the training program, which provides a public good, is $1,080,000, so even without a detailed analysis of the project it is

Table V-1

Project Assumptions

Capital Cost	$10,000,000
Cost of Training Workers	$ 2,000,000
Permanent Jobs Created	200
Training Cost per Job	$ 10,000
Annual Sales (1st year of operation)	$10,000,000
Annual Fixed and Variable Cost	$ 7,400,000
Annual Profit	$ 2,600,000
Project Duration	9 years
Inflation Rate	11%

Taxes	Normal	Mfr. Sector
Tax Rate	46%	40%
Depreciation Schedule	150% D/B	S/L
Depreciable Life	9 years	2 years

clear that is desirable from a public perspective.* Thus, the problem is to design the incentive package with the lowest value that makes the project feasible from a private perspective. For purposes of illustration, we assume that the project sponsors are granted two forms of tax relief--accelerated depreciation of the capital stock and a reduction of the income tax rate (federal plus provincial) from 46 to 40 percent.

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*The specific present value calculations are given on page 79.

Identifying Relevant Future Cash Flows

Table V-2 sets forth Net Income after Tax and Cash Flow for the project, given standard tax treatment. We assume "standard" treatment to be (1) a 46 percent tax on Net Income (36% Federal plus 10% provincial tax) and (2) capital consumption allowances taken on a 150 percent declining balance schedule.

As a tax incentive to job creation, Canada gives favorable tax treatment to capital investments in the manufacturing and processing sectors of the economy. Manufacturing and processing concerns pay a reduced tax of 40 percent (30% Federal, 10% provincial) on qualified Net Income. Furthermore, investments in manufacturing and/or processing equipment can for tax purposes be written off on a 2-year, straight-line depreciation schedule.

In order to separately identify the changes in cash flow associated with each of these tax incentives, it is helpful to break down project returns into their several components. Standard accounting practice gives as the definition of net cash flow (cash return) the following:

$$\begin{aligned}\text{Net Cash Flow} &= \text{Net Income after Tax} + \text{Depreciation} \\ &= (\text{Operating Income} - \text{Depreciation})(1 - \text{Tax Rate}) \\ &\quad + \text{Depreciation}\end{aligned}$$

For the purpose of identifying the impact of a particular tax incentive, it is convenient to rewrite the definition as:

$$\begin{aligned}\text{Net Cash Flow} &= \text{Operating Income}\,(1 - \text{Tax Rate}) \\ &\quad + \text{Depreciation}\,(\text{Tax Rate})\end{aligned}$$

Table V-2

Illustrative Project Cash Flows

Year	0	1	2	3	4	5	6	7	8	9
Capital Flows										
Capital Cost	10,000	0	0	0	0	0	0	0	0	0
Training Cost	2,000	0	0	0	0	0	0	0	0	0
After Tax Training Cost	1,080	0	0	0	0	0	0	0	0	0
Base Income and Net Cash Flow										
Sales	0	10,000	11,100	12,321	13,676	15,181	16,851	18,704	20,762	23,045
Cost	0	7,400	8,214	9,118	10,120	11,234	12,469	13,841	15,364	17,054
Operating Income	0	2,600	2,886	3,203	3,556	3,947	4,381	4,863	5,398	5,992
Depre-ciation	0	1,667	1,389	1,157	964.5	964.5	964.5	964.5	964.5	964.5
NIBT	0	933.3	1,497	2,046	2,591	2,982	3,417	3,899	4,434	5,027
Tax	0	429.3	688.7	941.2	1,192	1,372	1,572	1,793	2,039	2,313
NIAT	0	504	808.4	1,105	1,399	1,611	1,845	2,105	2,394	2,715
Cash Flow A	0	2,171	2,197	2,262	2,364	2,575	2,809	3,070	3,359	3,679

The first term in the expression is known as the project's "After Tax Operating Income," the second is referred to as the project's "Depreciation Tax Shield."

The impact of a preferential income tax rate on After Tax Operating Income to the project is demonstrated in Table V-3. Operating Income (after tax) in every year is 9 percent (Δ Tax Rate/(1 - Tax Rate)) higher than it would have been if taxes had been assessed at the normal 46 percent rate.

The effect of an accelerated (2 year) depreciation schedule and the lower tax rate on the project's Tax Shields is illustrated in Table V-4. Here the impact of the tax incentive on project performance is somewhat more complicated than the effect of a straight tax reduction: returns in years 1 and 2 are substantially higher than under standard taxation, but returns in years 3-9 are reduced from the fact that the capital consumption allowance and its associated tax shield have been used up.

The total financial incentive provided by the combination of a reduced tax rate and accelerated depreciation schedule is shown in Table V-5. It is simply the corporation's incremental After Tax Operating Income from the lower tax rate plus the change in tax shields from the lower tax rate and accelerated depreciation schedule. These amounts reflect net changes in the taxes paid by the corporation to the government of Canada (both Federal and provincial) in each year of the project's life. Positive amounts thus represent a value to the project in the form of taxes not paid; negative amounts reflect additional taxes paid in the year shown. Note that a significant

Table V-3

After Tax Operating Income

Year	46% Rate	40% Rate	Difference
1	1404	1560	156
2	1558	1732	174
3	1730	1922	192
4	1920	2134	214
5	2131	2368	237
6	2366	2629	263
7	2626	2918	292
8	2915	3239	324
9	3236	3595	359

Table V-4

Depreciation Tax Shield

Year	46% Rate 150% DB	40% Rate 2 Year S/L	Difference
1	767	2000	1233
2	639	2000	1361
3	532	0	(532)
4	444	0	(444)
5	444	0	(444)
6	444	0	(444)
7	444	0	(444)
8	444	0	(444)
9	444	0	(444)

Table V-5

Year	Income from Lower Tax Rate	Extra Tax Shield	Total Incentive Provided
1	156	1233	1389
2	174	1361	1534
3	192	(532)	(340)
4	214	(444)	(230)
5	237	(444)	(207)
6	263	(444)	(181)
7	292	(444)	(152)
8	324	(444)	(120)
9	359	(444)	(84)

feature of the tax incentives is a change in timing: some portion of the tax is shifted from early to later years of the project's life. Given a positive discount rate (positive time value of money) this shift in the timing of tax collection will be of benefit to the project.

Discounted Present Value by Components

The cash grant-equivalent of the cash flows implicit in the tax incentives package should be assessed by calculating the present values of each component of extra return, and then summing present values over all components. This is in contrast to the usual approach

of aggregating the cash flows associated with each incentive component into a single cash flow for each year (period) and discounting this stream at a single rate. Valuation by components is conceptually superior because it allows recognition of differences in the riskiness of the various components. Further, it leads to a much more explicit analysis of the elements of an incentive package with a reduced chance of errors being introduced by unintended, implicit assumptions.* The use of an aggregate discount rate, ω, for discounting aggregate benefit/cost streams is a problem of social benefit/cost analysis once it is admitted that the social discount rate is a function of the social risk of the activity in question. However, the potential errors are greatest in the case of valuing cash flows whose riskiness differs substantially from that of the underlying project.

To perform the present value calculation, discount rates appropriate to each type of tax incentive must be identified. The theoretical issues underlying the choice of an appropriate discount rate were discussed in Section IV above; the following section addresses (1) the choice of discount rates for specific tax incentive packages as well as (2) the impact of inflation.

Determining the Appropriate Discount Rate

The future cash flows associated with various financial incentives may differ along several dimensions. They may be fixed in

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*For a lucid explanation of valuation by components--referred to as Adjusted Present Value in the corporate finance literature, see Brealey and Myers [1981, ch. 19].

money terms (nominal) or may be indexed explicitly or implicitly to the price level (real). They may be essentially "sure things" whose value, in either nominal or real terms, is predetermined and largely independent of project performance or they may vary with the project performance. Further, to the extent that the cash flows associated with an incentive vary with project performance, they may do so proportionately or in some nonproportionate manner. In each of these cases, a different discount rate will be appropriate, even if it is accepted that the appropriate social rate of discount is equal to the market rate applicable to claims on future cash flows with the same monetary and risk characteristics.

In this section, we first discuss discount rates for (essentially) riskless cash flows. We then discuss the relationship between discount rates and the monetary characteristics of the future cash flows. This is followed by a discussion of the appropriate discount rate for risky projects. The discounting of contingent claims, where the cash flow varies in a nonproportionate manner with the project's performance, is treated in a separate section.

Nominal versus Real Cash Flows. Interest rates on riskless fixed-income securities such as Canadian government bonds implicitly include two components, a real interest rate and a premium to compensate for anticipated inflation. The real interest rate reflects the tradeoff between present and future consumption of real goods while the inflation premium compensates the investor for the anticipated deterioration in the purchasing power of his money-fixed

claim. Future cash flows that are fixed in Canadian dollars should be discounted at a nominal rate that includes an inflation premium. Such a rate is given by the current government bond rate of roughly 13 percent. Based on historical experience, this 13 percent can be thought of as being comprised of a roughly 2 percent real rate (recall Table IV-3) and a 10-11 percent premium to compensate for anticipated inflation.

For cash flows that are indexed to the price level, the inflation premium is not relevant if the cash flows are stated in constant terms and, as a consequence, the 2 percent real component is the appropriate discount rate. However, if the estimates of cash flows are adjusted for expected inflation, then they are nominal flows that should be discounted at 13 percent.

Discounting Risky Cash Flows. To apply the concept of a risk-return tradeoff to the valuation of specific incentives (in this case, tax incentives) some further definitions are necessary. The discount rates we have presented are applicable to the expected values of future cash flows.* The expected cash flow is the projected cash flow for each possible outcome multiplied by the probability of that outcome. In the case of risky cash flows that are proportional to a project's profitability, but are not contractually fixed, the expected

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*An alternative approach is to compute the "certainty equivalent" of the cash flow distribution and discount at the riskfree rate. Note that the "certainty equivalent" is equal to the expected value only if the cash flow in question is absolutely riskless, i.e., its riskiness is totally diversifiable. See Brealey and Myers [1981, ch. 9] for a discussion of relationship between the two approaches.

flow may be more or less than the typical or most likely cash flow, depending on the total distribution of the cash flows. With cash flows which are contractually fixed but where there is a chance of default, the expected flow will be less than the promised flow. These concepts are illustrated in Figure V-2 below.

As we indicated in Section IV above, if the variability of a particular cash flow is unrelated to the general level of economic activity or other factors that affect significant fractions of the Canadian economy, the project-specific risks can be averaged out at the level of society and, thus, it will be appropriate to discount the expected value of the risky cash flow at the riskless rate. In contrast, if the cash flows vary in line with the general level of economic activity or with risk factors common to significant sectors of the economy, they will be "risky" and their expected value should be discounted at a (higher) rate determined by the equilibrium risk-return tradeoff prevailing in the economy. Extensive theoretical and empirical research on market risk-return tradeoffs (cf. Section IV) suggests that the risk premium applicable to industrial projects of "normal" risk is on the order of 6-8 percent, that is, three to four times the pure time value of resources!

Table V-6 provides a summary of the discount rates applicable to the various types of cash flows. These rates are consistent with current information on (1) Canadian anticipated inflation and (2) the Canadian market's risk return tradeoff (e.g., Table IV-3). Although cash flows are identified as either riskless or risky, it should be recognized that in reality they lie along a continuum between the two

Figure V-2

Promised, Most Likely, and Expected Cash Flows

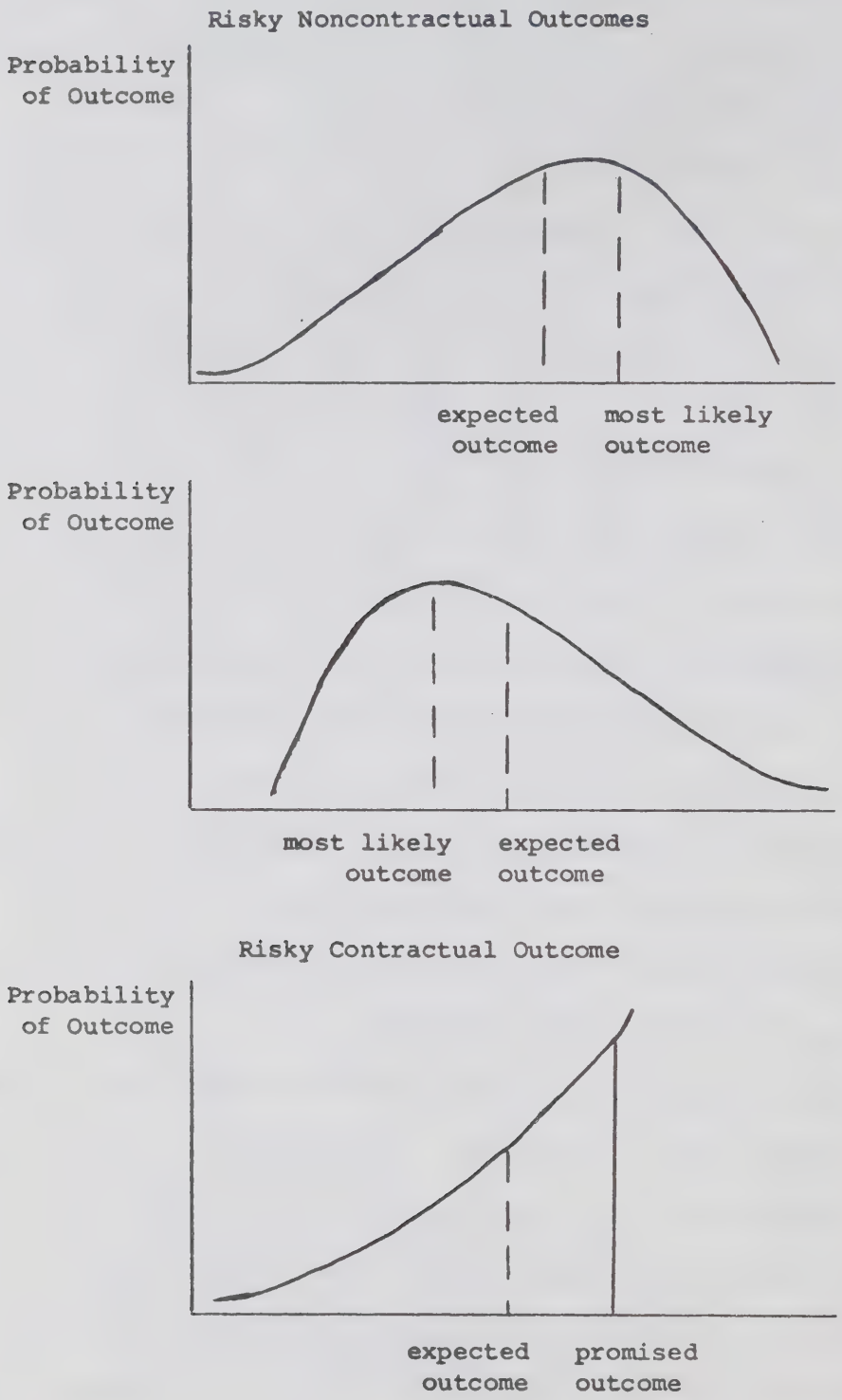


Table V-6

Appropriate Discount Rates for Cash Transfers of Various Types

	Nominal	Real
Riskless	Government bond rate (13%)	Government bond rate less anticipated inflation (2%)
Risky (β = 1)	Government bond rate plus risk premium (21-22%)	"Real" government bond rate plus risk premium (10-11%)

extremes. Hence, the risk premium cited should be viewed as an illustrative rate for a project of standard (β = 1) riskiness.

For future cash flows whose value will vary with a project's performance (such as the benefits resulting from a reduced corporate tax rate), the flows may be expressed either in current or constant terms as a matter of convenience. If the projected cash flows are based on profit projections that include an adjustment for inflation, an inflation premium should be incorporated in the discount rate. If the projected cash flow, in contrast, is computed in real terms, the discount rate should not include any adjustment for inflation.

We illustrate the valuation of both riskless and risky cash flows with examples of tax incentives employed in Canada. We then turn to the valuation of contingent contracts which we illustrate with a hypothetical loan guarantee.

Assessing the Present Value of Tax Incentives

Turning back to the manufacturing project discussed above, we are now in a position to estimate cash grant-equivalents for the incentives provided in the form of a reduced tax rate and an accelerated depreciation schedule. We can also calculate the impact of these incentives on the corporation's decision to go ahead with the project or not.

For purposes of the example, we assume that the project is of standard social risk ($\beta = 1$) and that the cash flows estimated represent expected (mean) cash flows in every year. The problem is then to assess appropriate discount rates for the two types of incentives afforded to the project: (1) additional income obtained through reduction in the tax rate and (2) changes in the magnitude and timing of project tax shields (tax reductions due to accelerated depreciation).

Since the tax on operating income is a proportionate tax, the future cash flows, associated with a tax incentive, reflect the fundamental riskiness of the project. Taxes on operating income go up when a project performs well and down when a project does badly. For this reason, the appropriate discount rate for After Tax Operating Income (including income derived from a reduction in the tax rate) is a risk-adjusted rate which should reflect the fundamental uncertainty embodied in the project.

In our generic project, cash flows were calculated in nominal terms, and we assumed the project to be of standard risk. The

appropriate discount rate is thus the sum of three components: (1) the real risk-free rate (2%), (2) a premium for social risk (9%), and (3) a premium for anticipated inflation (11%):

$$\text{Discount rate} = 2\% + 9\% + 11\% = 22\%$$

In contrast to taxes on operating income, depreciation tax shields represent implicit "tax abatement contracts" between a firm and the government. As long as the firm is not a "single project" company, it may apply its depreciation deductions to income from any source. Depreciation tax shields are thus less risky than the projects they are associated with: for firms with income streams derived from diverse sources, depreciation tax shields may be effectively riskless sources of return. Conversely, as long as the deductions are almost sure to be taken, tax shields represent an almost certain reduction in tax payments to the firm. On this basis the appropriate discount rate for tax shields (including incremental changes due to favorable tax treatments) is a risk-free rate; however, since capital consumption allowances are <u>not</u> indexed to inflation the appropriate risk-free rate is the rate applied to money fixed claims. We estimated that rate to be 13 percent (comprising a 2% real risk-free rate and an 11% inflation premium).

Table V-7 presents net present value calculations for the generic manufacturing project considered above. Return streams and associated incentives were each discounted by the rate appropriate to their type. Based on these calculations, the project under standard tax treatment is not economically viable: its Net Present Value

Table V-7

Net-Present Value of Project and Tax Incentives

($000)

	Net Present Value of:		
	Basic Project	Government Incentives	Project + Incentives
Capital Flows	-11,080	-	-11,080
After Tax Operating Income (22%)	7,311	812	8,123
Tax Shields (13%)	2,777	559	3,336
Total	-992	1,371	379
After Tax Cost of Training Program	1,080		
Present Value of Project Without Training Program	88		

(Discount rates shown in parentheses)

amounts to -$992,000 (Column 1, Table V-7). However, the NPV shortfall is entirely attributable to the (after tax) cost of training workers ($1,080,000): without the cost of the training program, the project's NPV is +$88,000. A case for government intervention can thus be made.

Tax incentives provided to the manufacturing sector in the form of lower tax rates and accelerated capital consumption allowances have an aggregate present value of $1,371,000 (Column 2, Table V-7).

The tax incentives are thus sufficient to shift the project from negative to positive NPV status. However, by their very nature the tax incentives cannot be efficiently tuned: in this case, their net impact is to over-compensate the corporation undertaking the project (although the $379,000 unnecessarily transferred does not appear excessive).

To this point, we have talked about cash "grant equivalents" as if all grants were equivalent. However, even within the realm of grants, there may be differences in the tax treatment of a particular transfer. Grants may be either taxable or taxfree, and if they are for the purchase of capital equipment they may or may not reduce the cost basis for tax depreciation. In Canada, most capital grants are exempt from taxation but do reduce the basis for depreciation. Hence, the net cash flow is the grant less the present value of the reduced depreciation tax shields. Operating grants or subsidies, in contrast, do not reduce depreciation tax shields, but if expenditures covered by a grant are not deductible for purposes of computing Canadian taxes, it is as if these grants were taxable. These differences are particularly important when interactions of Canadian and U.S. or other foreign tax systems are considered.

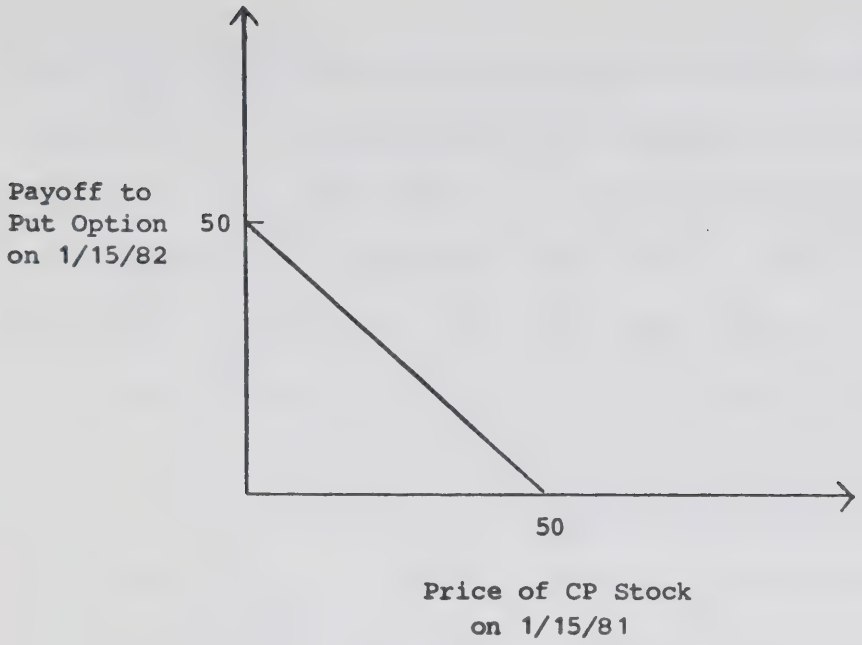
Valuing Contingent Claims

In contrast to financial incentives that involve riskless cash flows (e.g., favorable depreciation or interest subsidies) or cash flows that are proportional to the value of a risky project (e.g., a favorable corporate tax rate), many financial incentives involve cash

flows that depend on project performance in a more complex fashion. An example of such an incentive is a loan guarantee where there is a substantial risk of default. The possibility that the guarantor will have to "make good" on the loan is a contingent asset, since the expected cash flows associated with the loan guarantee are contingent upon the project's performance. In this section, we demonstrate how this contingent asset can be valued using Contingent Claims Analysis (CCA).

The most straightforward example of a claim whose value is contingent upon some uncertain event is a put option, a contract which gives its owner the right to sell one share of a specified stock at a specified price on a specified date. A put option is a contingent claim because its future cash flows are contingent upon the uncertain value of the underlying stock at some date in the future. For example, the owner of one share of Canadian Pacific (CP) stock can buy a put option which gives him the right to sell that one share at $50 on January 15, 1982. Clearly the future cash flows to the put option are contingent upon the price of CP stock on January 15, 1982. This contingency is made clear through the use of a payoff, or future cash flow, diagram, Figure V-3. Note the payoff to the put option varies in a nonproportionate manner with the future price of CP stock. If the price of one share of CP is zero on January 15, 1982, then the payoff to the put option is $50, since the owner of the option has the right to sell something worth zero for $50. If the price of CP is $30, then the payoff to the option is $20 since the owner of the option has the right to sell something worth $30 for $50. If the

Figure V-3



price of CP is $50, or greater, then the payoff to the put option is zero since the right to sell CP stock at $50 a share does not have any value. Thus the future cash flow to the put option is contingent upon the uncertain price of CP stock on January 15, 1982.

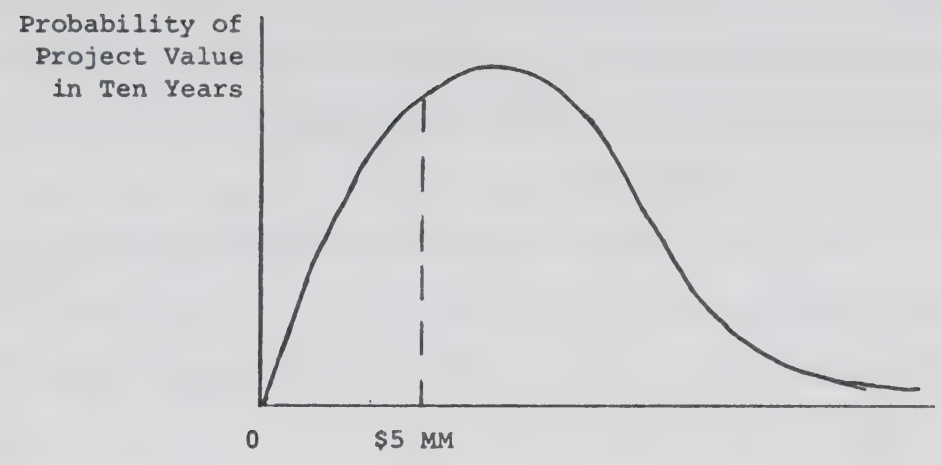
Now consider a project whose initial required investment is $10 million. Assume that part of this investment is financed by a government guaranteed loan. The loan has a scheduled principal repayment of $5 million due at the end of ten years. The government has assured the bondholders that if the project is unable to fully repay the promised principle of $5 million, then the government will make up any deficit up to the full $5 million. Clearly the project's creditors have been given an asset whose value is contingent upon the

value of the project in ten years. The question is how do we evaluate this asset.

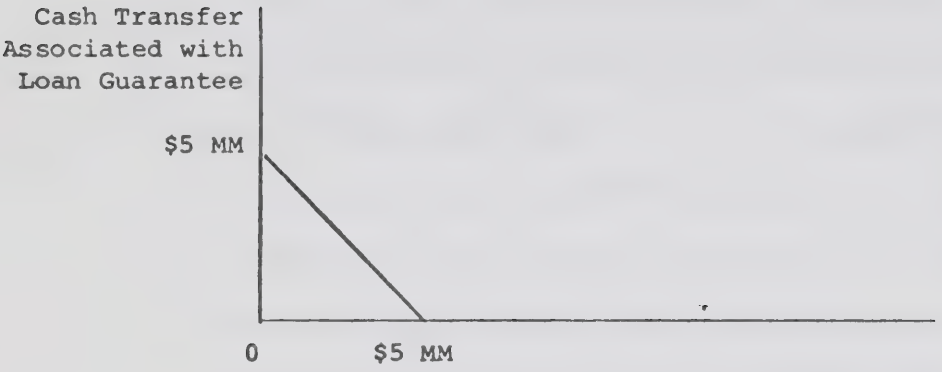
Borrowing directly from the preceding sections of this report, the value of the loan guarantee can be represented as the expected cash flow associated with the loan guarantee, discounted to the present by the proper risk-adjusted discount rate. From estimates of the project's overall return and risk characteristics, we can represent possible values for the project in ten years through a probability distribution, Figure V-4a. The probability that the project will be worth more than the promised $5 million, in ten years, is the area under the curve, to the right of the dashed line. Similarly, the probability that the project will be worth less than $5 million, in ten years, is the area under the curve to the left of the dashed line in Figure V-4a. Figure V-4b represents the cash flows the project's creditors will receive, in association with the loan guarantee, as a function of the value of the project in ten years. If the value of the project, at the end of ten years, is zero, then there will be a cash flow from the government to the bondholders of $5 million, since the project is unable to retire any of the promised principle. Similarly, if the value of the project, after ten years, is $4 million, then the cash flow will be $1 million. Lastly, if the value of the project is equal to or greater than $5 million, then there will be no cash flow from the government to the bondholders.

In order to compute the expected value of these cash flows, it is necessary to determine the probability distribution of the cash

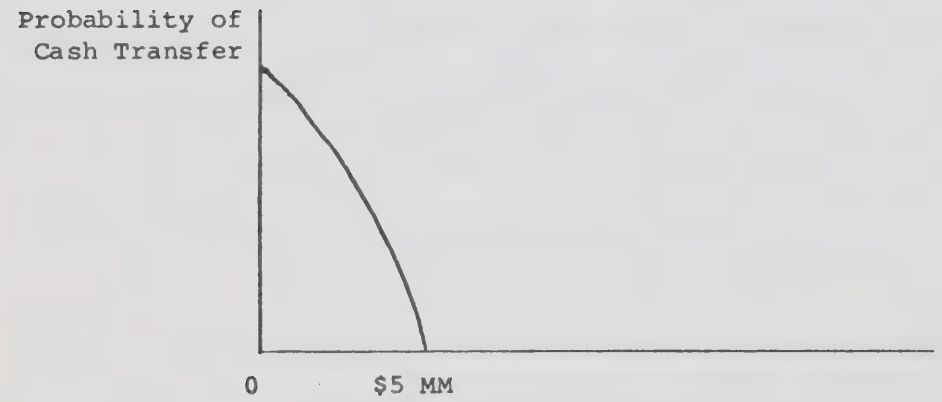
Figure V-4



(a)



(b)



(c)

flows. Figure V-4c is the required probability distribution.* Notice that Figure V-4c is simply the lefthand tail of Figure V-4a "turned around." Given Figure V-4c, it is straightforward to compute the expected cash flow by multiplying each possible cash flow by the probability of its occurrence.

It is at this juncture that the real problem arises; what risk-adjusted rate will we use to discount this expected cash flow? This is a difficult question since the cash flows associated with the loan guarantee do not vary in direct proportion to the value of the project, and therefore the rate of return the shareholders demand from the firm is not the correct discount rate. The only case where the project's expected rate of return could be used is if the project had no systematic risk. In that case the expected rate of return to the project would be the riskless rate of interest which in turn would be used to discount the expected cash flow associated with the loan guarantee, since the guarantee would have no systematic risk. However, most projects do have systematic risk and therefore the expected rate of return to a contingent claim, associated with the project, is unclear. This was a long-standing problem in financial economics which was resolved by the pioneering work of Fisher Black and Myron Scholes [19] which led to Contingent Claims Analysis (CCA). The key contribution of Black and Scholes was their demonstration that, if a

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*Strictly speaking, Figure V-4c is only part of the probability distribution, since the probability that the value of the project will be greater than $5 million (righthand tail of Figure V-4a), is all concentrated at 0 in Figure V-4c. We may ignore this since it will contribute nothing to our expected cash flow calculation.

minimal set of assumptions are met, it is possible to compute the value of the contingent claim with knowledge only of the riskiness (variance) of the underlying asset, the riskless interest rate, and the maturity of the claim.* In essence, a certainty equivalent of the future cash flows is formed which then can be discounted at the riskless rate of interest.

The manner in which this certainty equivalent of the future cash flows is formed is the following. Recall Figure V-4a, the probability distribution of the project after 10 years. This distribution is based upon assumptions concerning the expected rate of return to the project and the volatility of the rate of return. The expected rate of return determines the mean of distribution while the assumption on volatility determines its dispersion. The manner in which the certainty equivalent of the future cash flow is formed is to assume in the specification of the probability distribution of future project value, that the expected rate of return to the project is the riskless rate of interest. This will lead to a "new" distribution of future project values which is similar to the "true" distribution but shifted to the left as shown in Figure V-5. This transformation leads to a new distribution for the cash flows associated with the guarantee, Figure V-5c. The expected cash flow is then determined using this new distribution. This quantity is the certainty equivalent mentioned earlier. According to CCA, the value of the loan guarantee

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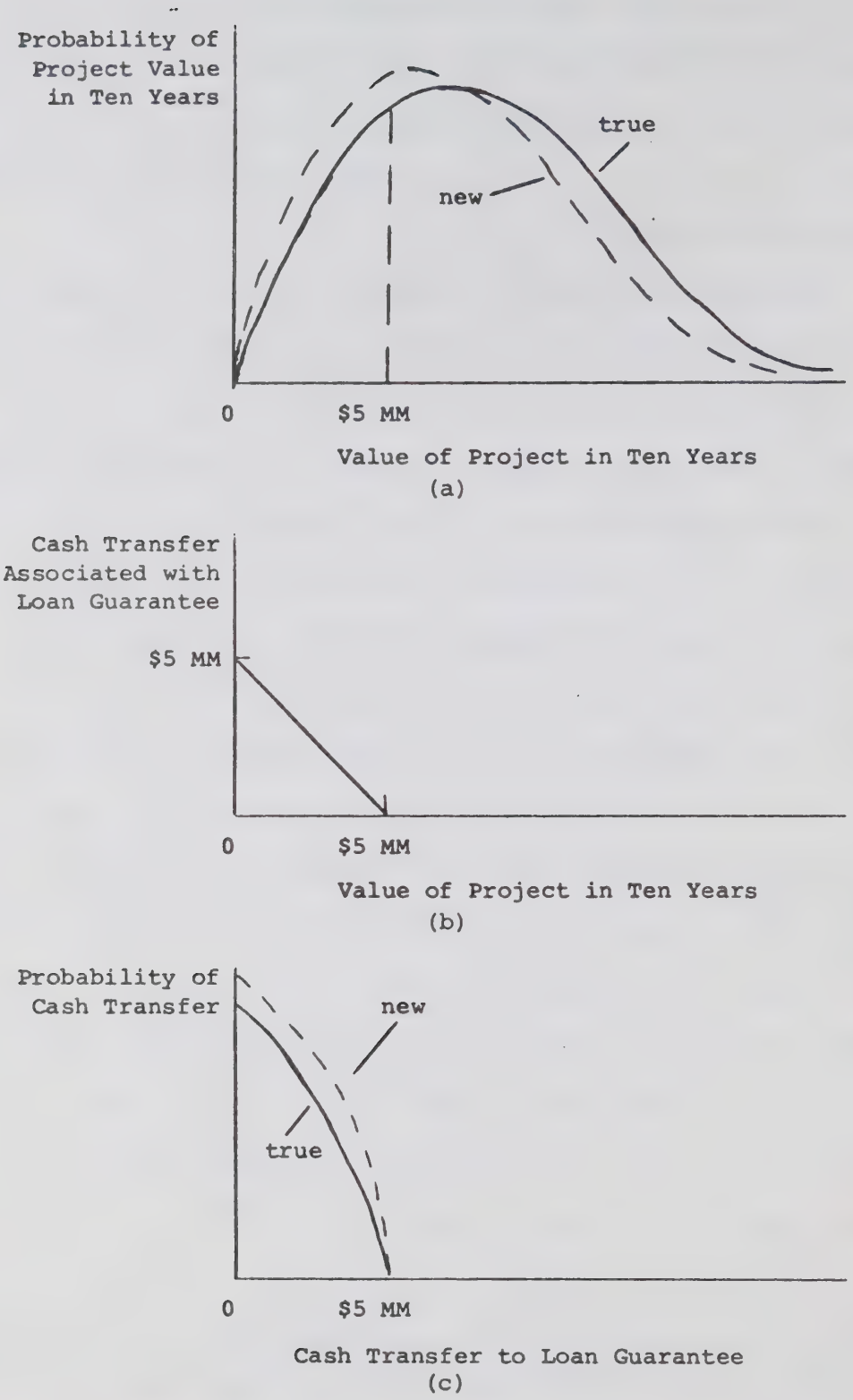
*The important assumptions, from the standpoint of this analysis, are (1) assets trade continuously, (2) the riskless rate of interest is known and constant and (3) asset prices are log-normally distributed.

Figure V-5

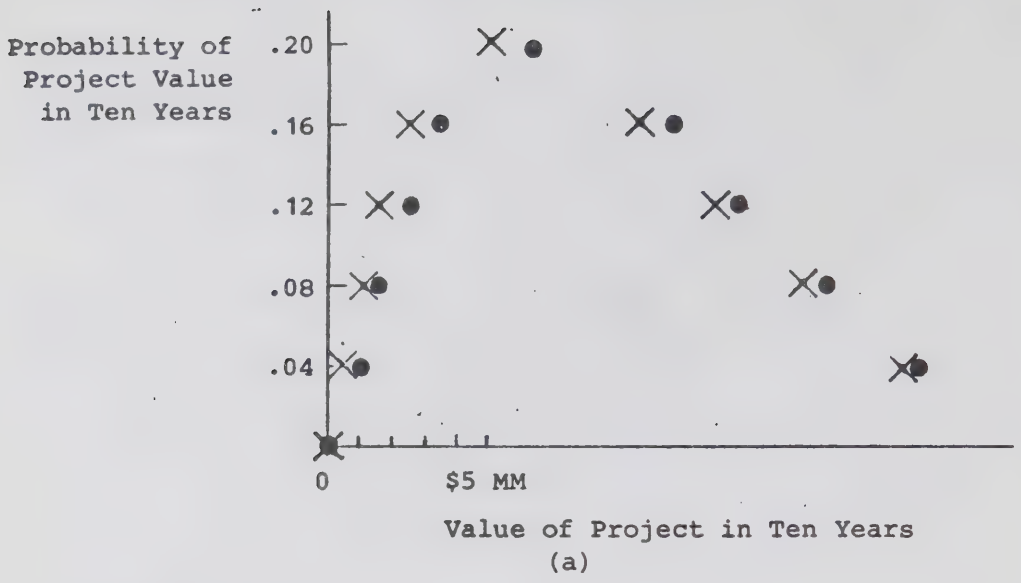

Probability of Project Value in Ten Years
true
new
0
$5 MM
Value of Project in Ten Years
(a)
Cash Transfer Associated with Loan Guarantee
$5 MM
0
$5 MM
Value of Project in Ten Years
(b)
Probability of Cash Transfer
new
true
0
$5 MM
Cash Transfer to Loan Guarantee
(c)

is this certainty equivalent discounted by the riskless rate of interest.

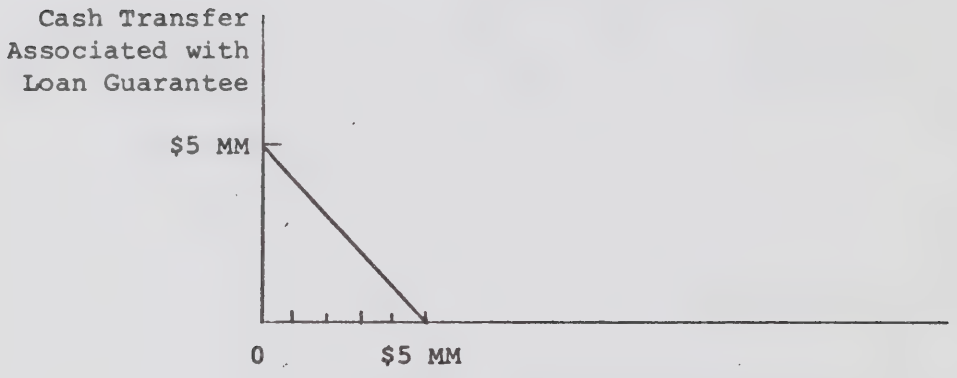
In an effort to make this certainty equivalent transformation clear, assume that the "true" probability assessment of the project's value in ten years can be represented as a discrete distribution, Figure IV-6a. The mean, or location, of this distribution is directly related to the project's expected rate of return, while the dispersion of the distribution is directly related to the project's volatility or risk. The lefthand tail of this distribution (to the left of a project value of $5 MM) gives the "true" distribution of the cash flows associated with the loan guarantee. As outlined previously, in order to utilize CCA, we must form a certainty equivalent of these future cash flows. This is accomplished by the specification of a "new" distribution of future project value, predicated on the assumption that the expected rate of return to the project is the riskless rate of interest. Note that in forming this new probability assessment, we retain the same assumption concerning the project's risk or volatility. Assume that this reassessment leads to the "new" distribution in Figure V-6a. This "new" distribution of project values leads directly to a "new" distribution of the cash flows associated with the loan guarantee, Figure V-6c. It is straightforward to compute the mean of this new distribution of cash flows. This mean is precisely the certainty equivalent which we seek.

$$\begin{aligned}\text{Certainty Equivalent of Future Cash Flowr} &= 0.20(\$0) + 0.16(2.5) \\ &\quad + 0.12(3) + 0.08(4) \\ &\quad + 0.04(4.5) \\ &= \$1.26 \text{ MM}\end{aligned}$$

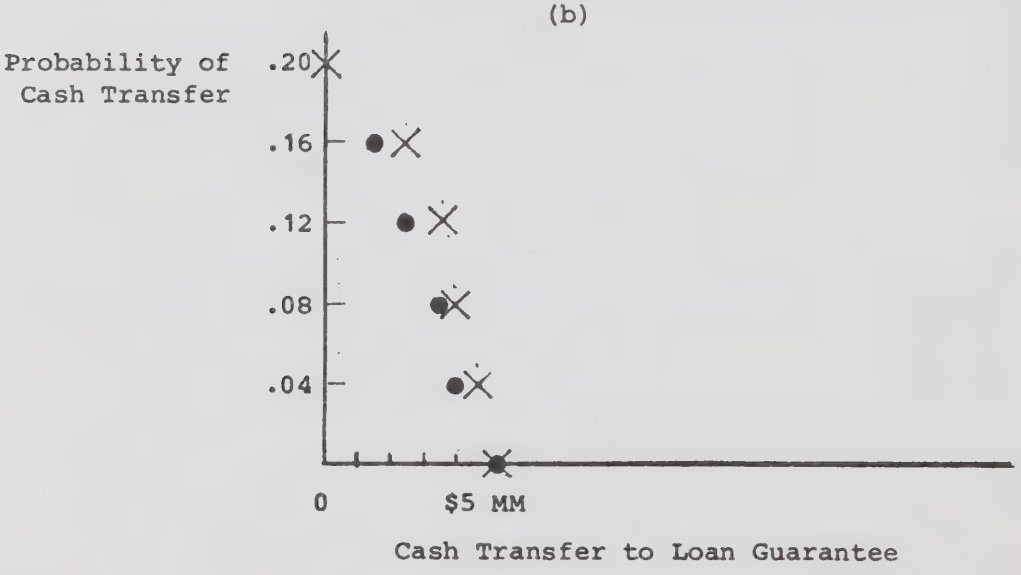
Figure V-6



(a)



(b)



(c)

According to CCA, the value of the loan guarantee is this certainty equivalent discounted by the riskless rate of interest. Assuming that the riskless rate is 13%/year, the value of the loan guarantee follows

$$\text{Value of Loan Guarantee} = \frac{\$1.26 \text{ MM}}{(1.13)^{10}} = \$371,181$$

Thus, according to CCA, when the government fully guaranteed the risky loan, the project's creditors were given an asset worth $371,181. If a fee were involved, then the value of a loan guarantee would be its value according to CCA minus the value of the fee.

While we have resorted to diagrams and discrete distribution in order to motivate Contingent Claims Analysis, under the assumptions used by Black and Scholes, this entire analysis collapses to a single analytic formula. Of course, the relevance of this formula depends upon the relevance of the underlying assumptions. For example, CCA assumes that the riskless rate of interest remains constant over the life of the contingent claim. This is clearly a strong assumption, particularly for long-lived contingent claims like loan guarantees. Other research has suggested that this assumption will cause the results of CCA to underestimate the true value of a loan guarantee.

Another assumption of CCA is that the variance or volatility of the return to the project can be estimated. This is not a problem if the project has a price history in public security markets. However, many times loan guarantees are let to projects which have no price history. In this case, a judgement must be made as to the volatility of the project. The most common method used is to infer a

volatility measure from other projects of similar risk, which do have price histories.

Another key problem in applying CCA directly to practical problems is the issue of payouts by the project. In order to utilize the analytic formula of Black and Scholes it is necessary to assume that the project will pay no dividends and that the bond receives no coupon payments. Clearly, most loan guarantee problems encountered in practice do involve dividend and/or coupon payments. In order to handle this issue, solutions must be estimated by computer. The software required to estimate these values exists today.*

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*See e.g. Jones and Mason [1980].

VI. FACTORS REDUCING THE SOCIAL BENEFIT OF FINANCIAL INCENTIVES

While financial incentives are generally aimed at modifying private investment decisions, there often are wide disparities between the intended effects of government intervention and their actual impact on private decision-making. Distortions will be classified as either (a) adverse selection of projects or (b) perverse managerial incentives. Perverse managerial incentives refers to possible undesired distortions in the operations of a project once it has been undertaken with the aid of financial incentives. Adverse selection describes possible distortions in the selection of projects by private entrepreneurs given these incentives.*

While all financial incentives can produce perverse managerial incentives, we believe undesired outcomes are especially likely in the case of loan guarantees (and, since they are similar, concessional loans to risky enterprises) because of the way the guarantee transforms the distribution of outcomes perceived by project owners or managers. As has been discussed, a loan guarantee is an asset to the owners of the project, since its presence allows for borrowing more than the project could justify without the guarantee, and at a lower cost. Therefore, one would expect that management would have the incentive to maximize the value of this asset, the loan guarantee, through its choices regarding the selection and operation of the

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*Further, to the extent that the social cost of a given financial incentive is computed incorrectly, it is possible that public decision makers will induce private entrepreneurs to undertake the wrong projects from a social perspective.

project. These actions will simultaneously maximize the expected cash flows between the project and the goverment. Concessional loans and tax abatements of various types also may distort managerial incentives in socially undesirable ways. We first discuss various factors that may lead to inappropriate choices of projects and then turn to the case of inappropriate decisions in the ongoing management that may result from various incentive measures.

With regard to the selection of projects, the provision of either loan guarantees or government loans in excess of the project's commercial debt capacity (even if at market rates) will result in the government bearing a disproportionate share of the project's downside risk and the entrepreneur claiming most of the upside potential. It is not hard to see that this will induce entrepreneurs to select relatively risky projects, even when the expected value of these projects from private or public perspectives is no greater than that of less risky alternatives. Not only may the induced increase in the project's risk increase the expected cash flows resulting from the guarantee, it may also reduce the social benefits of the project which were the justification for the financial incentive in the first place by increasing the likelihood of the project's failure, e.g., a plant closing. This is particularly serious in thin labor markets where risk of failure has high social costs.

Another likely distortion in project selection is the choice of labor-capital proportions. Assume that a firm that wants to build a new plant has two technologies that produce essentially the same output. The first technology is very labor intensive and thus will

create many jobs. The second technology is capital intensive and thus will not create as much employment. Further assume that from a private perspective, without government financial incentives, the plant is not profitable using either technology. Lastly, assume the firm approaches the government for some financial incentives for building the new plant. Although the justification for providing the incentives is the creation of jobs, it is quite possible that the incentives proffered will actually result in the firm adopting the capital intensive technology. For example, if the incentive takes the form of accelerated depreciation, it clearly increases the after-tax attractiveness of capital relative to labor. Further, if capital grants reduce the investment basis for depreciation but operating (or training) grants reduce deductible expenses, the taxation of the grants will tip the scales toward capital. Finally, to the extent that government loans or loan guarantees are tied to purchases of tangible, mortgageable assets, a similar shift will take place. Tax related incentives are also likely to alter the choice of project life, although the direction of the effects is much more difficult to assess and generalizations are dangerous.

Once a project is selected and comes on stream, similar distortions may result in the operating decisions made by private managers. With regard to management's behavior towards risk, while it is true that the risk of a project may be largely determined at the outset by the nature of the assets employed, it is also true that the risk of the project can be altered through ongoing operating decisions (e.g., pursue a "go for broke" marketing strategy, drill the

riskier wells first). Common sense suggests that the value of the loan guarantee must increase if the risk of the project increases. Thus it will be in management's interest to operate the project at the maximum risk level.

Standard non-guaranteed debt also tends to create managerial incentives to increase project risk. If the risk of a firm is increased over time, the bondholders are hurt and the equityholders gain. However, bondholders typically guard against managerially induced shifts in the risk of a firm through restrictive covenants written into the bond indenture. Of course, a certain amount of monitoring is necessary to enforce these covenants. When the government fully guarantees a loan, the bondholders have no incentive to monitor the project's actions since the value of their investment is independent of the project's value. Therefore, if the government is to manage the value of the loan guarantee it must monitor the project's managerial decisions. This may be expensive, particularly if the infrastructure does not exist to knowledgably monitor specialized projects. One simple way to avoid, or minimize, these monitoring costs is for the government to <u>partially</u> guarantee the debt, such that the private lenders have some risk-exposure to the project. If this exposure is sufficiently large, the private lenders will, through their monitoring efforts, guard against increases in the project's risk.

Again, given a project financed with a fully guaranteed loan, management can be expected to request that the maturity of the debt be lengthened or the dividends to equityholders be increased. Both of

these actions increase the value of the guarantee to the project. Lengthening the maturity of the debt, and therefore the maturity of the loan guarantee, can increase the government's risk exposure. Increasing dividend payments diverts assets out of the project, therefore increasing the risk of default and increasing the value of the loan guarantee.

Another example of perverse managerial incentives is the potential for early abandonment of projects. If the financial incentives which were granted to promote the project are "front-ended," rather than keyed to specific actions such as employing a certain number of workers for more than, say, 2 years, it may be to management's best interest to abandon the project. Examples of "front ended" financial incentives are direct cash grants, stepped-up depreciation allowances or tax holidays. The value of these financial incentives would be reflected in the initial value of a project, but once the flow of financial incentives stopped, it may be in management's best interest to liquidate the project. Even if there is little likelihood of abandonment under the initial circumstances of the project, if there are major competitive or technological shifts which threaten the project, management may have little incentive to persevere.

However, incentives in the form of government loans or loan guarantees will be even worse when due to such shifts the project is no longer viable unless additional investments are made. In such a case, the true value of the loan or loan guarantee will have fallen substantially, perhaps to zero, but the claim on the government

remains at the face value of the loan extended or guaranteed. If the equityholders provide the funds necessary to restore the firm to profitability, the total value of the project will increase. However, this increase in the value of the project will decrease the value of the guarantee or restore the value of the loan since the probability of default of the outstanding loan has been decreased. Thus the equityholders and management will properly perceive that while this new investment, per se, will increase the value of the firm as a whole, some or all of this increase in value will accrue to the government as the lender or guarantor. In fact, it is possible, due to a significant reduction in the chance of failure coupled with a modest increase in expected profitability, that the increase in the value of the loan or decrease in the value of the guarantee (an asset to the equityholders since it is a claim on the government) will be larger than the total increase in the firm's value. Thus, by following a socially prudent rescue strategy, an entrepreneur may worsen his position!

One way to avoid this problem is to design financial incentive packages to allow renegotiation and the possible infusion of additional guaranteed debt contingent on incremental capital outlays. However, this may create incentives for managers to misrepresent the circumstances of their firm, increasing an already difficult monitoring task.

It should be noted that this analysis is not restricted to firms that will fail unless an additional investment is made. It may occur whenever any external shock or realization that initial project

estimates were overoptimistic cause the true value of a government loan to fall below its face value or the value of the guarantee to rise and where some follow-on investment would be desirable if the firm were financed entirely with equity.

While the question of the cost of financial incentives is crucial, a closely related question is how can the government assure itself that it has minimized the cost of financial incentives for a given stream of benefits. One solution to this problem that is often proposed is that firms should compete for the financial incentives, implying that the competitive process will lead to the least cost set of incentives. This competitive solution may lead to another form of adverse selection. Assume that the government were to competitively let loan guarantees to promote job creation. The government has a certain type project in mind and the initial required investment is the same for all the competing firms. The firms submit their bids in the form of how much of the initial required investment must be underwritten by fully guaranteed debt. The loan guarantee is to be awarded to that firm which requests the least amount of guaranteed debt. Further assume that there is a trade-off between labor and capital in carrying out the project. The larger the amount of capital, the more heavily leveraged the project becomes, in an operating sense. The more leveraged the project becomes, the more risky the project becomes. The more risky the project, the more valuable the guarantee becomes. The more valuable the guarantee, the less amount of debt need be guaranteed. Given that all the competing firms realize this tradeoff, the only rational bid to submit is one which

reflects operating the project in the most capital intensive, and therefore, most risky manner. This will lead to less job creation and work counter to the stated objective.

There exists another type of adverse selection which can be termed "sharing the public surplus." Assume that a firm has analyzed a project and concluded that the project is profitable on a private basis. However, the firm has also concluded that there are substantial public benefits associated with the project. Then it is only rational that the firm approach the government for financial incentives. These incentives are not needed to make the project viable, but instead are a means by which the firm may share in the public surplus. This is a difficult situation to analyze. If the government feels the firm will undertake the project without financial incentives, then a possible response is to refuse to negotiate. However, if the firm has the option of building the project in a high unemployment area or a low unemployment area and it so happens that the project is privately profitable in both areas, while being more profitable in the low unemployment area, then it is rational for the firm to approach the government and for the government to negotiate.

"Leakages" Associated with Various Incentives

Another problem with specific financial incentives is that some of the benefits which represent costs to the Canadian government may accrue not to the firm obtaining the incentive, but to a foreign government instead. A particular case in point is that of reduced tax rates or accelerated depreciation when these are granted

to U.S.-controlled firms. Because of the interactions between the U.S. and Canadian tax systems, many of the Canadian tax benefits granted to the U.S. firm will be taxed away by the U.S. Treasury. In these cases, the Canadian government bears the full cost of the measures but obtains only a fraction of their incentive effect.

United States firms, which account for the bulk of foreign investment in Canada, are taxed by the U.S. on their world profits which include foreign profits when these are remitted but can credit foreign taxes paid against their U.S. tax liability. Since the majority of U.S. investments in Canada are relatively stable, mature enterprises, a substantial proportion of their profits are remitted to the parent firm. If the parent firm faces a weighted average effective tax rate on its foreign operations of 46 percent or less, the so-called unused tax credits position, they will be taxed on 46 percent using U.S. rules regarding depreciation and other deductions on their remitted profits. To the extent that favorable tax rates or depreciation allowances reduce effective Canadian taxes below this 46 percent, the U.S. will tax away the difference. Thus, many U.S. firms will not benefit in any way on Canadian tax abatements on that proportion of their earnings remitted to the U.S.*

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*See Horst [1977] and Adler [1974] for a more detailed discussion of the interaction between the two tax systems.

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